

85 01748

v. 2

COUNCILMEMBER GILDA FELLER
Civic Center Building
2180 Milvia Street
Berkeley, Calif. 94704

**CONCEPTUAL DESIGN OF
TRANSFER STATION/MATERIALS &
ENERGY RECOVERY FACILITY
CITY OF BERKELEY**

SOLID WASTE MANAGEMENT CENTER

**FINAL REPORT
NOVEMBER 1980
VOLUME II**



GARRETSON · ELMENDORF · ZINOV
ARCHITECTS AND ENGINEERS

124 SPEAR STREET, SAN FRANCISCO, CALIFORNIA 94105



BROWN, VENCE & ASSOCIATES

ENERGY & ENVIRONMENTAL ENGINEERS
124 SPEAR STREET
SAN FRANCISCO, CALIFORNIA 94105



85 01748
V.2

VOLUME TWO

APPENDIX A - APPENDICES

APPENDIX B - WORKSHEET

APPENDIX C - PLANNING TEAM REVIEW

APPENDIX D - INFLUENCES ON SOLID WASTE DIRECTIVITY

**CONCEPTUAL DESIGN OF
TRANSFER STATION/MATERIALS &
ENERGY RECOVERY FACILITY
CITY OF BERKELEY**

SOLID WASTE MANAGEMENT CENTER

**FINAL REPORT
NOVEMBER 1980
VOLUME II**

Prepared for:

THE CITY OF BERKELEY
Department of Public Works
2180 Milvia Street
Berkeley CA 94704

Prepared by:

BROWN, VENCE AND ASSOCIATES
Energy and Environmental Engineers
P.O. Box 7202
San Francisco CA 94120

Telephone: 415/434-0900

GARRETSON • ELMENDORF • ZINOV
Architect and Engineers
124 Spear Street
San Francisco CA 94105

Telephone: 415/434-3838

VOLUME TWO

APPENDIX A: REFERENCES

APPENDIX B: WORKPLAN

APPENDIX C: INDEPENDENT ENGINEER REVIEW

APPENDIX D: SUPPLEMENTAL INFORMATION ON ELECTRICITY MARKET

APPENDIX E: STEAM MARKET SURVEY MATERIALS AND LETTERS OF INTENT

APPENDIX F: SECONDARY MATERIAL MARKETS - CONSULTANT REPORT AND SURVEY MATERIALS

APPENDIX G: EFFECTS OF EXPANDED RECYCLING PROGRAMS - CONSULTANT REPORT

APPENDIX H: AIR POLLUTION CONSULTANT REPORT

APPENDIX I: PROJECT DRAWINGS

APPENDIX J: PROJECT OUTLINE SPECIFICATIONS

APPENDIX K: O&M AND REVENUE ASSUMPTIONS

APPENDIX L: FINANCING ALTERNATIVES - CONSULTANT REPORT

APPENDIX M: IDENTIFICATION OF PROJECT RISKS - CONSULTANT REPORT



Digitized by the Internet Archive
in 2024 with funding from
State of California and California State Library

<https://archive.org/details/C124880480>

APPENDIX A

REFERENCES

1. U.S. Government, Federal Register, Department of Energy, Federal Energy Regulatory Commission, Vol. 45, No. 38, p. 12215.
2. Garretson · Elmendorf · Zinov · Reibin, City of Berkeley Solid Waste Management Center, Phase One, June, 1978.
3. SCS Engineers, Survey of Solid Waste Quantity and Composition in the San Francisco Bay Area - Final Report, September, 1978.
4. Lipson, C., and Sheth, N., Statistical Design and Analysis of Engineering Experiments, McGraw-Hill, NY, 1973, p. 77ff.
5. Garretson · Elmendorf · Zinov · Reibin, Solid Waste Resource Recovery System for the County of Humboldt, March, 1976.
6. Garretson · Elmendorf · Zinov · Reibin, Solid Waste Resource Recovery System for the County of Humboldt - Phase Two, September, 1978.
7. Systems Technology Corporation, Small Modular Incinerator Systems with Heat Recovery: A Technical, Environmental and Economic Evaluation, 1979.
8. CH₂ M Hill and Winzler and Kelley, County of Humboldt, Solid Waste Resource Recovery Study, April, 1978.
9. Bureau of Mines, "Pre-Burn Separation Should Limit Metal Emissions," Waste Age, September, 1978.
10. U.S. Government, Federal Register, Department of Energy, Federal Energy Regulatory Commission, Vol. 45, No. 38, p. 2232.
11. U.S. Government, Federal Register, Department of Energy, Federal Energy Regulatory Commission, Vol. 45, No. 56, p. 17971.

APPENDIX B
WORK PLAN

CONCEPTUAL DESIGN STUDY WORK PLAN

TASKS A through C were performed by the City of Berkeley and not part of the Scope of Work for the Consultant Team.

Task D Independent Analysis

Objective: To validate the previous studies performed by Berkeley and the decision that modular incineration is the best resource recovery solution for Berkeley to pursue.

Workplan:

Tasks:

D1 Review GEZR's Work

A qualified reviewer not associated with GEZR shall conduct a review of the GEZR work and Berkeley's situation to date and a review of the completed proposed work by GEZR. Determine strengths and weaknesses of the study data and recommendations. Provide additional data or information that is readily available from reviewer's past experience.

D2 Prepare and Write Report

Prepare the report on the review of GEZR's work. The report shall include whether GEZR's solution for Berkeley's energy recovery project is the best one and whether any other solutions should be considered.

Output: A decision whether to proceed with modular incineration as Berkeley's energy recovery facility and a review of the completed proposed work by GEZR.

Task E Secure Markets

Objectives: Estimate quantities and types of materials and energy to be recovered from the resource recovery facility. Obtain Letters of Intent from potential customers. Estimate revenues for proposed systems.

Previous Work: Work done by Berkeley's consultant GEZR found a market for steam, but not for electricity, within range of the proposed site. The results of a previous marketing survey by GEZR identified excellent markets for mechanically recovered aluminum,

corrugated boxes, and ferrous materials. Markets for materials recovered through source separation were excellent for ferrous, aluminum, glass, newspapers and corrugated boxes and good for grades of office paper and grease. Markets for all the materials were identified and preliminary estimates of the revenues were calculated.

Workplan:

Tasks:

E1 Confirm Markets for Steam

E1.1 Establish Specific Market Terms, Conditions, and Product Specification Requirements

Identify potential steam customers within a serviceable radius of the Gilman Street Site. For each, identify the terms and conditions which may be offered or required for purchase of steam in the following modes: interruptible, non-interruptible, full scale output, and single module output. Discuss with each: contractual possibilities, floor and market price arrangements, length and degree of commitments, and guarantees, as appropriate. Establish required product specifications, and market development plan.

E1.2 Obtain Letter of Intent

Develop model Letters of Intent indicating terms and conditions associated with steam delivery in each appropriate mode (interruptible, non-interruptible, full scale and single module). Request submittal of a Letter of Intent from appropriate potential customers and attempt to obtain as firm as possible the Letters of Intent.

E1.3 Establish Revenue from Sale of Steam

Based on the above marketing data, estimate expected revenues from sale of steam under the various modes.

- E2 Confirm Markets for Recoverable Materials
- E2.1 Identify Types and Quantities of Recoverable Materials Available from the Recommended Waste Processing System
- E2.2 Obtain Letters of Intent
Develop Letters of Intent indicating terms and conditions associated with the recoverable materials for the mechanically recovered materials. Attempt to obtain Letters of Intent for the recovered materials from the purchasers.
- E2.3 Establish Revenues from the Recoverable Materials
Based on the above market data and transportation costs, estimate expected revenues from the sale of recoverable materials.
- Output:** Letters of Intent from potential customers and estimated revenues for marketable energy and marketable materials.
- Task F Waste Stream Analysis**
- Objectives:** Obtain more accurate refuse composition and quantity data to better define the project.
- Previous Work:** Information on refuse composition was compiled of past sampling work performed by: the University of California at Berkeley, Berkeley Waste Classification (most recent survey in 1974), and Solid Waste Management Alternatives for Alameda County (June 1974); and the League of Women Voters of Berkeley, Home Separation of Recyclables in Berkeley (March 1976). Information on refuse quantity was based on work performed by: Peter Chiu and Luis Diaz, Development of a Solid Waste Processing Transfer Station in the City of Berkeley (May 1976); Annual Route Check, City of Berkeley (1976); and interviews with Mr. James Farhner, operator of Berkeley Landfill Company, Mr. Mike Bauman, and the City's Public Work's Staff.

Workplan:

Tasks:

F1 Refuse Composition Analysis

F1.1 Sampling Methodology

Utilizing methodology developed by SCS Engineers for State Solid Waste Management Board decide on the:

- Number of samples
- Sample size (in pounds)
- Route and load selection (Consider stratifying by generating source and income levels of residential sources.)
- Other factors as identified during course of study

F1.2 Sorting Procedure

Identify sorting procedures and composition classifications into which refuse will be sorted. Composition classifications will be selected with regard to potential markets (e.g., paper, glass, metals, energy, compost, etc.)

F1.3 Supervise Sampling

Supervise the sorting of refuse samples at the landfill on the following schedule:

- Surveys during the first, fourth, and eighth months of the study period
- Samples for each survey will be taken over a five (5) day period

Sorting labor shall be provided by GEZR, as well as tabulation and analysis of data.

F1.4 Laboratory Analyses

Conduct laboratory analyses to determine:

- Moisture content
- Dry ash percentage
- Calorific value

- F1.5 Tabulate Data
Tabulate composition data and laboratory analyses. Calculate significant statistical parameters.
- F2 Refuse Quantity Survey
- F2.1 Develop Survey Methodology
Develop methodology for conducting waste quantity survey.
- F2.2 Conduct Survey
Lay scale(s) and tabulate appropriate data.
- F2.3 Analyze Data
Analyze data tabulated in Task F2.2. Determine average quantities, daily, and seasonal variation and other key parameters.
- F2.4 Determine How the Curbside Collection Program Affects the Resource Recovery Facility's Waste Stream
The types and quantities of wastes that would be removed from the resource recovery facility's waste stream through the curbside collection program will be estimated.
- F2.5 Project Future Quantities
Based on results of Task F2.3, local population projections, and other relevant factors, project waste quantities over the 1980-2000 planning period.
- Outputs:** Accurate up-to-date information on the refuse composition and quantity. Information regarding all relevant parameters to include the moisture content, dry ash percentage, and calorific value of the refuse.
- Task G Technology Assessment**
- Objective:** Examine the possible front-end and rear-end processing technologies as they pertain to modular incineration.

Workplan:

Tasks:

G1 Define Processing Technologies

Define possible front-end and rear-end processing technologies compatible with modular incineration. This should include such processes as trommelining, shedding, air classification and magnetic recovery.

G2 Examine the Effect of Processing Technologies on the RDF

Examine how each processing technology affects RDF as it pertains to steam production.

G3 Examine the Processing Technologies in Regard to Recovery of Marketable Materials.

G4 A Decision on the Best Processing Technology for This System

Weigh the costs and benefits of the processing technologies in G2 and G3 and decide the best processing technology for this system.

Output: A decision whether a processing technology will be used and, if so, the processing technology identified.

H. Permits and Environmental Requirements

Objectives: Assess all applicable environmental constraints, and required approvals and necessary permits. Determine the feasibility of the proposed system meeting these requirements. Prepare tentative schedule for satisfying these requirements.

Workplan:

Tasks:

H1 Assess Air Pollution Control Requirements

Obtain, evaluate and analyze appropriate test data on air pollution emissions from comparable facilities using the same energy recovery process as proposed for this project. Identify those air pollution control technologies which are capable of achieving regulatory limits and recommend best alternative.

H2 Assess Water Pollution Control Requirements

Obtain, evaluate and analyze appropriate test data on wastewater discharges from comparable facilities. Identify those water control technologies capable of achieving the regulatory limits and recommend the best alternatives.

H3 Assess Ash/Residue Disposal Requirements

Obtain, evaluate and analyze appropriate test data on ash and residue from comparable facilities. Identify special handling, storage and disposal requirements. Determine the method and cost of disposing of the quantities of residue expected from the proposed facility.

H4 Assess Potential for Noise Problems

Evaluate the potential for noise problems due directly to the facility during construction and operation, as well as indirectly due to the movement of refuse vehicles on the site.

H5 Identify All Applicable Permitting and Approval Requirements

Identify each organization which has authority and requirements for permits or approvals which are applicable to the proposed project. Specify the requirements to obtain each permit or approval. This should include the process, as well as the time constraints. Prepare a logical plan and to the extent possible a schedule for obtaining necessary permits and approvals.

Outputs: Air emissions, water discharges and ash residue will be characterized in terms of applicable regulatory standards. Alternative controls for achieving air and water pollution standards will be identified and the best options recommended. Disposal of ash/residue will be planned and the cost estimated. Potential noise problems will be assessed and the need for controls identified. All permits and approvals required will be identified. A schedule for obtaining them will be prepared.

I. Determine an Accurate Estimate of All Costs to Construct, Operate and Maintain the Proposed Facility Throughout Its Useful Life

Objective: An accurate cost estimate is absolutely essential to the decision to proceed with this project. This task is to define the criteria upon which costs depend and to accurately estimate the lifetime costs of the project.

Workplan:

Tasks:

II Establish Detailed Design Criteria for Construction, Operation and Maintaining

Establish all criteria pertinent to the design of the proposed facility which affect its construction, maintenance and operation. Criteria shall include but by no means be limited to the following:

- types and quantities of waste
- hours of operation
- labor requirements
- solid waste processing requirements
- steam delivery conditions
- site preparation requirements
- facility layout
- equipment required
- maintenance requirements
- utility requirements

Equipment lists, staffing charts, and maintenance schedules will be prepared as required for an accurate cost estimate.

I2 Prepare Conceptual Design of Proposed Facility

Detailed engineering design is not within the scope of this grant. However, a conceptual design targeted at estimating the costs of the project is necessary. The consultant must trade off between the additional accuracy to be gained by actual design and that of using accepted estimating techniques. The conceptual design drawings that are deemed necessary follow and may be modified during the grant with prior approval from the grantee and EPA.

I3 Determine Estimate of Resource Recovery Facility Costs

The work performed in tasks I1 and I2 will be used to determine an accurate estimate of all the costs associated with the proposed facility throughout its useful life. To be included are the construction, operation, maintenance costs, and the effect of curbside collection with and without source separation. Revenues should be estimated and net costs presented.

Output: This task should result in a clear understanding of the factors affecting the costs of the facility. It should define the facility design criteria to the extent necessary to estimate costs. The final product is an estimate of the costs associated with the facility over its useful life, as well as the confidence limits of the estimates.

J. Define and Evaluate the Elements of Risk Associated With the Project

Objective: Identify the numerous elements of risk associated with this project. Develop alternative approaches to allocating the risks among those involved with the project and recommend a preferred strategy to adopt.

Workplan:

Tasks:

J1 Identify the major elements of risk involved in implementing the proposed system, emphasizing to whom the risks accrue (re: facility owner, facility operator, etc.) and quantifying them to the extent possible. Risks to be considered should include but not be limited to:

- assuring waste supply
- changes in waste composition
- system reliability
- market commitment
- future legislation
- associated landfill problems
- force majeure

- J2 Develop alternative plans for allocating the risk elements identified in J1.
- J3 Evaluate alternatives and recommend the preferred strategy of alloating the risks.
- Output:** This task will result in a clear understanding of the risks involved, and a recommended strategy for allocating risks among all likely project participants.

K. Develop Method and Plan of Financing

Objective: Arrive at the financing plan which is best suited to this project and the Berkeley situation

Workplan:

Tasks:

K1 Identify City Financing Strategy

Identify financing strategies available to the City for the financing of solid waste management facilities which meet California law and local restrictions.

K2 Identify Private Financing Strategy

Identify financing strategies for private sector ownership and/or participation in the proposed facility.

K3 Identify Other Factors Affecting the Financing Strategy

Discuss any regulation or legislation relevant to the financing of the project, as well as assistance programs available under State statutes. Discuss Federal tax rules and assistance which are applicable to the financing of the project.

K4 Develop a Recommended Financing Strategy for the Project

On the basis of the information in tasks K1, K2, K3, recommend a single best approach to financing the project. Provide pros and cons of each alternative considered.

Output: This task will result in an analysis of alternative financing methods and a recommend strategy for this project.

L. Identify and Recommend Procurement Approach

Objective: Determine the most compatible procurement approach considering all pertinent factors in the project.

Work Plan:

Tasks:

L1 Evaluate the data developed to select the best procurement approach. The recommendation should consider the technical, legal, financial and risk aspects of the proposed facility.

L2 Prepare a plan and a schedule for implementing the recommended procurement approach.

Output: This task will result in a recommended procurement approach and a plan to implement the approach.

M. Report Preparation

Objective: To allow effective monitoring of the project and to establish an accurate record of progress.

Workplan:

Tasks:

M1 Prepare draft reports on each task within two weeks after completion. Reports should be a comprehensive description of the methodology, findings and recommendations. All data pertinent to the findings should be included with sources clearly identified. Use of tables and graphical representation is encouraged where appropriate.

M2 Prepare final report at the completion of all tasks. Submit a table of contents of the final report for approval prior to writing the final report. Upon approval of the report outline, complete the final report in draft form.

- M3 Prepare as a separate document an Executive Summary describing the project, findings, assumptions, and recommendations. Submit in draft form for comments.
- M4 Revise final report and summary as indicated by reviewers. Print 120 copies and distribute as follows:

100 copies to City of Berkeley
20 copies to Environmental Protection Agency

N. Travel

Objective: To visit and study resource recovery sites and attend appropriate meetings that provide information applicable to Berkeley's resource recovery project.

Workplan:

Tasks:

N1 Travel to Appropriate Meetings

Attend specified EPA briefings, implementation workshops and other applicable seminars and meetings. Conduct meetings as necessary to obtain relevant project information.

N2 Travel to Appropriate Sites

Visit facilities that can provide resource recovery information applicable to the project.

Output: Accumulation of the latest applicable resource recovery information that can be used in making project decisions.

APPENDIX C

INDEPENDENT ENGINEER REVIEW

CSI RESOURCE SYSTEMS, INC.
27 October 1980

Mr. Michael J. Baumann
Solid Waste Project Manager
City of Berkeley
2180 Milvia Street
Berkeley, California 94704

Mr. James D. Leach, P.E.
G•E•Z•R
124 Spear Street
San Francisco, California 94105

RE: Engineering Review of the Proposed Berkeley Energy Recovery Project

Sirs:

Resource Systems has completed its review of the following documents which contain the findings and recommendations of G•E•Z•R on the "Conceptual Design of Transfer Station/Energy Recovery Facility, City of Berkeley -- Solid Waste Management Center":

- Draft Final Report - Executive Summary, August 1980.
- Draft Final Report - Volume I, August, 1980.
- Draft Final Report - Volume II, August 1980.
- Conceptual Design Drawings - Solid Waste Management Center, May 1980.

While we believe the concept of the project to be attractive and potentially workable, we are unable to confirm the projected economics and performance of the system. We believe that the likely consequence of not correcting and revising the analysis at this stage would be development of a system which could not attain the performance, recovery efficiencies, and economics that have been projected. The following outlines the areas where we have found problems.

PERFORMANCE OF FRONT-END PROCESSING SYSTEM

The concept of front-end processing to produce a higher quality fuel and to provide for recovery of high quality recyclables is consistent with the city's recycling goals and may also minimize the amount of ash and residuals which must ultimately be landfilled. However, our review of the specified hardware and proposed operating schedule for the front end causes us to question the projected performance. For example, in regard to trommel performance, Reynolds Aluminum has found that garbage bags fail to break when first introduced into their two-stage trommel in Houston. As a result, much of the fine wet material exits through the large secondary holes with recyclable materials rather than with waste material. This greatly reduces the efficiency of the aluminum recovery system possibly jeopardizing its performance.

The throughput estimate of 116,875 tons per year (TPY) for the front-end process is inconsistent with the information in the design and operating specifications. For example, given a 40 ton per hour (TPH) throughput rate, a 40-hour week operating schedule will only process 83,000 TPY.

Furthermore, there are inconsistencies in the bulk density values (i.e., pounds per cubic yard) for municipal solid waste products cited in the specifications and the field observations of MSW bulk density which are cited in the calculation package. This raises the possibility that the specified conveyor capacities will limit throughput to significantly less than 116,875 TPY.

PERFORMANCE OF THE COMBUSTION SYSTEM

We consider modular combustion unit (MCU) technology to be a proven technology in processing MSW to produce low-pressure saturated steam for industrial process applications. In other settings, we have recommended its application. However, the concept of firing MCUs with processed municipal solid waste to produce superheated steam has not been demonstrated in commercially operating systems in this country. The performance of such a system is problematical because of variable gas mass flow rate and temperature (it will swing from 1800°F to 2200°F). This is an inherent characteristic of systems which use a semi-continuous feed of MSW fuel. This characteristic can lead to fluctuations in superheater steam outlet temperature and flow which will stress the boiler and turbine during low- and high-temperature excursions. Perhaps an attemperator or staged superheater would smooth the high-temperature fluctuations but low-temperature events will still jeopardize the turbine's reliability. The uncertainties involved in using MCU-generated superheated steam to drive turbines introduce a significant element of technical risk which can affect the availability of the system and thus its economic performance. Consequently, we believe that the estimate of system availability (85 percent) is overly optimistic. The trade-offs involved in alternative design approach should be considered. For example, the system could be designed to use a saturated-steam turbine to generate power. This will, of course, entail lower generating efficiency and consequently less electricity revenue. In any case, alternative design approaches should be analyzed from a technical and economic standpoint.

PERFORMANCE OF THE TURBINE GENERATOR STEAM CYCLE

We have not received a copy of the system heat balance. We have reviewed the steam piping drawing and found several violations of the appropriate ASME codes and conventional industrial power plant design practice. We strongly recommend an review and redesign of this portion of the system.

For example:

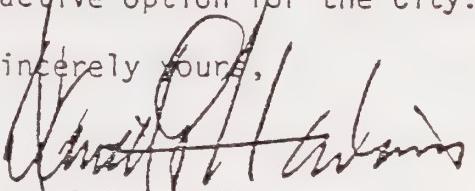
- It is very unusual to throttle an uncontrolled turbine extraction point rather than use a turbine extraction valve. In addition, uncontrolled extraction is usually held to 10-15 percent of total turbine throttle flow to prevent turbine damage. Our reading of the report indicates approximately 30-percent uncontrolled extraction.
- The blowdown heat recovery system appears to allow 150 pound water to flash before discharging to the sewers. This is very hot water for dumping into a sewer and poses a safety hazard which may be in violation of city code standards.
- We cannot determine whether there have been provisions made for a return condensate storage tank.
- It is not clear how a vacuum will be pulled on the condenser.
- There may be problems with cavitation of the feedwater pumps considering the relatively small vertical distance between the deaerator and the boiler feed pumps.
- The design specifications show that the turbine supply and extraction lines are not interconnected. This potentially prevents delivery of any steam to Cal Ink during periods of turbine outage and might require operating in an incinerator-only mode even when some steam could be sold.
- The design parameters of the system and the energy use requirements of Cal Ink call for the delivery of 150 psig saturated steam at the average rate of 15,000 lbs/hr. However, the extraction rate specified for the turbine is 12,000 lbs/hr. These rates need to be made consistent.

ENVIRONMENTAL ISSUES

There are significant unknowns involved in achieving compliance with the rigorous air emission limitations of the Bay Area Air Quality Management District (BAAQMD). We are unaware of any MCU systems in operation that use tail end air pollution control equipment to meet local air quality regulations. However, we agree that it is very likely that additional clean up of particulate in the stack gases will be required in Berkeley. MCU systems have been proposed and are being constructed with baghouses for particulate control. The pollution control device recommended for this system is a granular bed particulate filter. There is no operating history for either device to verify their ability to remove particulate from gases produced by an MCU. We believe the report should discuss the technical uncertainties in this area and that the project, prior to specifying an air pollution control technology, should initiate discussion with the BAAQMD relative to the conditions under which an operating permit would be issued to the facility.

In summary, we recognize our comments differ substantially with key findings and recommendations contained in the report. Additional work is required to verify that an energy recovery project is a technically and economically attractive option for the City.

Sincerely yours,


Daniel A. Harkins
Senior Associate

DAH/mfp



BROWN, VENCE & ASSOCIATES
Energy and Environmental Engineers

November 13, 1980

Mr. Michael J. Baumann
Solid Waste Project Manager
City of Berkeley
2180 Milvia Street
Berkeley, CA 94704

Subject: Response to "Conceptual Design of Transfer Station/ Materials and Energy Recovery Facility, City of Berkeley - Solid Waste Management Center"

Dear Mr. Baumann:

The intent of this letter is to respond to the 27 October 1980 CSI Resource Systems review of the "Conceptual Design of Transfer Station/Materials and Energy Recovery Facility, City of Berkeley - Solid Waste Management Center" prepared by GEZ and BVA. Responses will follow the general format of the CSI letter.

Performance of Front-End Processing System

With proper trommel design, i.e., appropriate lifters and bag breaking devices located in the front end of the trommel, plastic garbage bags of the type used in Berkeley should have an excellent opportunity to break in the first stage. If, however, the results are less than expected, "jeopardizing" the performance of the aluminum recovery system has little impact on project economics.

The design capacity of the plant needs to be 60 tons per hour. The trommel specified in the draft is incorrect and has been corrected to reflect the increased capacity requirements: The increased cost of the new trommel does not significantly alter project economics.

The inconsistencies in bulk density values have been corrected. There is no adjustment necessary to the conveyors as they were conservatively designed utilizing accepted engineering practice in the solid waste industry. Please refer to Exhibit 1. The adequacy of their design has been further confirmed by our engineering staff.

Mr. Michael J. Baumann
Page Two
November 13, 1980

Currently, there are no operating systems utilizing modular combustion units (MCU) to fire municipal solid waste (MSW) that generate superheated steam. This fact has been pointed out in the BVA/GEZ report to Berkeley. As pointed out in CSI review, one of the problems with superheat sections in MCU's will be the variability of gas massflow and temperature because of the semi-continuous feed to the MCU. It is not clear how a properly desired boiler will be stressed by this condition. The desuperheaters would protect the turbine from damage due to overheat. It is not clear how low temperature fluctuation, if they occur, would affect turbine reliability. Because the feed to the MCU's consists of preprocessed waste, more uniform in heat value and moisture content than raw MSW, low-temperature excursions are expected to be minimized. The amount of superheat selected for this conceptual design is 60°F. This modest degree of superheat was chosen to limit risk. In addition, a facility in Auburn, Maine will be operating shortly producing 60°F-100°F superheat from MSW fired MCU's. Operating data from this facility will aid Berkeley in evaluating any RFP submitted to them proposing superheat from MCU systems.

In the event the superheater section fails and superheat is interrupted to the turbine, bypassing the superheat section would allow 600psig, 550°F dry saturated steam to be delivered to the turbine with approximately 5% reduction in energy output. Consequently, 85% availability is not felt to be overly optimistic.

Performance of the Turbine Generator Steam Cycle

Comments on page three of the CSI letter are not violations of any known code. More information is needed to respond properly.

- "Uncontrolled" extraction utilizing a PRV value outside the turbine is used in many industrial installations in quantities exceeding 30%. In California, for example, uncontrolled extraction of up to 50% is used at Diamond Sunsweet and Tri-Valley Growers. Turbine damage at higher extraction rates is prevented by controlling condenser water flow and by air bleeds to condensor.
- The blowdown heat recovery system does have cold water injection to avoid discharge of hot water to sewer. See M-4.
- The deaerator serves as a return condensate storage tank.
- More information needed; question not clear.
- Approximately 12 feet of head between feedwater pump and deaerator is shown. This is more than adequate to prevent cavitation in a properly selected pump.
- The interconnection of the turbine supply and extraction lines was added during print checking and apparently was not in CSI's review set. It is shown on Sheet M-4.

Mr. Michael J. Baumann
Page Three
November 13, 1980

- The design parameters of the system and the energy use requirements of the 150 psig saturated steam will be made consistent at 15,000 pounds/hour.
- Particulate control technology has been discussed with the BAAQMD. Please refer to Exhibit 2.

Very truly yours,

BROWN, VENCE & ASSOCIATES

Thomas D. Vence

Thomas D. Vence
Vice President

TDV:jb

Encl.

cc: Daniel A. Harkins, CSI

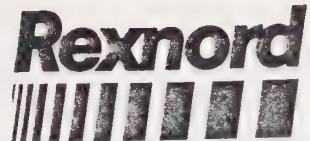


EXHIBIT 1

9th October 1980

**Sales & Marketing
Division**

BROWN, VENCE & ASSOCIATES
124 Spear Street
San Francisco, CA 94105

8105 Capwell Drive
Oakland, CA 94621
415/562-6518
TWX 910/262-3405

Attention: Mr. Tom Vence

Re: City of Berkeley
Solid Waste Facility

Dear Tom:

In accordance with our discussion earlier this week concerning the apron conveyor taking the over-sized material away from the trommel, I checked with Henry Lisiecki and he advises that the 84" wide conveyor is still recommended, even considering a density of 5#/CF.

The size of the conveyor is not really selected by material load or material depth. On these in-feed conveyors, the width is really selected to accommodate almost any type of over-sized material coming in. So, if you have an 84" wide conveyor feeding the trommel, you better have an 84" wide conveyor taking the over-sized material away from the trommel.

The only effect the lighter material density will have, is that the material depth might be slightly greater. But, this conveyor is inclined, with continuous skirts, so material depth is no problem.

I tried unsuccessfully to call you several times with this information so thought I better put it in a letter so you will have it. If anything further is required, call me.

Thanks very much.

Yours Very Truly,

A handwritten signature in black ink that appears to read "Ken Gunderson".

Ken Gunderson
District Sales Representative

KGG:rr



BROWN, VENCE & ASSOCIATES
Energy and Environmental Engineers
124 Spear St., San Francisco, CA 94105

MEMORANDUM

TO: File

JOB NO.: 79120

FROM: A. Topper

PROJECT: Berkeley SWMC

DATE: 4/29/80

SUBJECT: BAAQMD Meeting

Addendum to R. Lunche's meeting notes:

The BAAQMD has previously granted some permits to small controlled air incinerators.

Use of electroscrubbers to control particulate emissions @ the Berkeley SWMC would allow an offset exemption for innovative technology.

Notes show .4 lbs per BTU for NO_x emissions levels calculations.

BAAQMD will be concerned if hydrogen chloride levels are excessive.

Conceptual drawings are acceptable for application submission; allow 1 to 2 years for negotiations leading to submission of an application for a permit to construct.

ARB approval required only if offsets are required; that decision is due 30 days after publication of notice of public hearing.

Recommended seeking permit for 4-1 units if emission levels will allow, if not, then 3-1 units; the subsequent unit addition (to make 4-1) would be subject to BACT review at that time.

Recommended BVA attendance at Sanitary Fill's public hearings especially in regard to Berkeley SWMC public opposition (concern mostly about emissions from unknown sources; see EPA viral and bacterial emissions report).

cc: T. Vence
T. Reilly
D. Foster - 2
A. Topper
Chronological File

AT:jp



JOB FILE

BROWN, VENCE & ASSOCIATES
Energy and Environmental Engineers
124 Spear St., San Francisco, CA 94105

MEMORANDUM

TO: File JOB NO.: 79120
FROM: R.G. Lunche, A. Topper,
and D. Foster PROJECT: Berkeley
DATE: 4/30/80 SUBJECT: Summary of Meeting Between
BAAQMD and BVA on 4/11/80

Tom Vence, Tom Reilly, Dave Foster and Amanda Topper of Brown, Vence & Associates (BVA) and Bob Lunche, a BVA consultant, met with Dan Goalwin and Herb Johnson of the Bay Area Air Quality Management District (BAAQMD) in the BAAQMD offices from 10:00 AM to 11:45 AM on April 11, 1980. Bob Jung of the BAAQMD joined the meeting about 30 minutes before its termination.

Tom Vence summarized the concept for the City of Berkeley Solid Waste Management Center (SWMC). Mr. Goalwin responded by saying that the BAAQMD had decided recently to approve an application by Sanitary Fill for a much larger facility, 1000 t/d, than the Berkeley facility. He made the side comment that he had heard the Berkeley facility would not be built and the solid waste for that facility would go to Richmond for disposal. Mr. Goalwin suggested that BVA obtain a copy of the BAAQMD report on the Sanitary Fill application, which will be available to the public in a few days, and also attend the hearings in May for a preview of the process facing Berkeley.

Mr. Goalwin discussed some aspects of the Sanitary Fill application. The facility will use cyclonic precleaners and a baghouse for particulate control; a dry scrubber for SO₂ control; and ammonia injection for NO_x control. The dry scrubber operates by spraying a lime slurry into the flue gases which reacts with the SO₂ and is then dried to a powder and collected as a particulate.

Earlier, an electrostatic precipitator had been planned for the Sanitary Fill facility but, under Air Resources Board (ARB) pressure, this has been changed to a baghouse. In other words, ARB had insisted that a baghouse fulfilled the requirement for best available control technology (BACT) and not the precipitator. Ammonia injection as a proven control technology for NO_x emissions from incinerators is not yet, according to Mr. Goalwin, supported by actual test data. Sanitary Fill is expected to receive an exemption from some of new source review (NSR) requirements on the basis of "innovative technology." Near the end of the meeting, Bob Jung who had processed the Sanitary Fill application said that the BAAQMD had accepted the emission projections made by Sanitary Fill and had not introduced emission factors or emission projections of its own.

BAAQMD had been given a copy of the report on "Air Pollution Aspects of the City of Berkeley Solid Waste Management Center" in advance of the meeting. This report was discussed with them, especially the emission projections, applicable regulatory standards and implications of the emission projections with respect to action of the BAAQMD. Reliance on the study and report by SYSTECH was explained to the BAAQMD, and Herb Johnson copied the title of the report and SYSTECH's address. BAAQMD representatives did not commit themselves to accept the SYSTECH test procedures, results or emission factors, but neither did they indicate any intention to dispute them.

Mr. Goalwin was familiar with the Dry Scrubber, the predecessor to the Electro-scrubber being considered as the particulate control device for the SWMC. He was willing to accept the Electroscrubber on the basis that particulate emissions with the device were below 150 lbs/day as projected. He commented that carbon monoxide (CO) should not be a problem for the SWMC since the BAAQMD considers CO to be an automobile-related emission. Mr. Goalwin suggested that the SO₂ emissions, which were projected to be just above 150 lbs/day, be reexamined. A simple control might be adequate to reduce SO₂ below the 150 lbs/day level and might also reduce HC emissions which Mr. Goalwin pointed out could be high enough to cause concern. Mr. Goalwin said the BAAQMD would accept SO₂ emissions obtained by material balance and said that the sulfur remaining in the residue or converted to particulate should be considered in the calculation.

In-stock monitoring will be required according to Mr. Goalwin (although I do not know which rule will be used to invoke that burden), and ground level monitoring for SO₂ concentrations may be required. In answer to a question as to BAAQMD's definition of BACT for NO_x emission from controlled air incinerators, Mr. Goalwin said that a performance standard such as .4 lbs per million BTU might be used instead of an equipment specification.

Mr. Goalwin said that the BAAQMD would be revising its rules to be consistent with Assembly Bill No. 524 by Calvo. Qualifying projects could then be exempted by the BAAQMD from emission offset requirements in accordance with the bill.

Mr. Goalwin observed that NO_x emissions was the principal emission problem with the SWMC. If lower charging rates and/or fewer modules were used to reduce emissions below problem levels, the BAAQMD could issue permits with conditions limiting the charging rates. The facility would have to substantiate those rates by operational records. In stock monitoring records also could be used as evidence of compliance if permit conditions were based on emission levels.

In the BAAQMD rules, a reference to ambient air quality standards refers to both national and state standards. It was Mr. Goalwin's opinion that, as far as a Prevention of Significant Deterioration (PSD) review, EPA was only concerned with particulate and SO₂ emissions. He said that EPA's PSD reviews were routine.

Several times during the meeting BAAQMD representatives stressed the impact of reaction from the public on the type of project planned by Berkeley. They said the public's concern must be considered and taken into account. They also advised BVA to follow the progress of the Sanitary Fill application for possible application to the Berkeley facility.

DF:jp

cc: T. Vence
T. Reilly
D. Foster - 2
A. Topper
Chronological File

APPENDIX D

**SUPPLEMENTAL INFORMATION
ON ELECTRICITY MARKET**

PACIFIC GAS AND ELECTRIC COMPANY

COPY

June 24, 1980

Mr. Roy Oakes, Director
Department of Public Works
2180 Milvia
Berkeley, California 94704

Dear Mr. Oakes:

PGandE has been contacted by your consultant, Brown, Vence & Associates, concerning the Berkeley Resource Recovery Project and stands ready to work with the City and its consultant to assist in its timely progression.

In an effort to promote energy conservation and reduce reliance on scarce fossil fuels PGandE is encouraging cogeneration and solid waste projects such as that planned for Berkeley. PGandE will buy any electric energy or energy and capacity generated by this project under terms and conditions similar to those contained in the attached Power Sales Agreement form, dated February 4, 1980 and at prices established in PGandE's latest Schedule of Energy Purchase Prices contained therein. Further, PGandE is willing to consider other arrangements presented by Berkeley that are amenable to both the City and PGandE.

Please contact me if you have any questions regarding PGandE's role in the Berkeley Resource Recovery Project.

Sincerely,

HARRY M. HOWE

Attachment

cc: Michael Baumann

PACIFIC GAS AND ELECTRIC COMPANY

— 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4311 • TWX 910-372-6587

SPECIAL ANNOUNCEMENT ABOUT CO-GENERATION AND SMALL POWER PRODUCTION FEBRUARY 1980

Our records indicate that you may have an interest in or potential for co-generation or certain other small power production facilities. For this reason we are pleased to advise you of some recent dramatic new developments in this area.

The California Public Utilities Commission (CPUC) has authorized new and attractive power purchase prices to encourage the production and sale of electric power to PG&E from qualified facilities using co-generation or generation using fuels derived from biomass, wood waste or refuse.

Attached for your information is a copy of our new form of Power Sales Agreement which contains the terms under which we will make individual offers to purchase power from these generation facilities. Included in the agreement is a definition of the applicable generation facilities, the current schedule of prices for energy and capacity delivered to us, the conditions pertaining to interconnection, protective devices, metering and operating procedures. These terms, prices and conditions may require adaptation in particular cases.

Other small power producers with generation from such energy sources as wind, solar, hydro and geothermal will also be able to sell power to PG&E under somewhat similar prices and terms.

Besides the above new incentives, all of these power producers may receive standby and supplementary power in accordance with PG&E's existing tariffs on file with the CPUC.

We recommend that you assess the possible benefits of developing co-generating facilities or generation using fuels derived from biomass, wood waste or refuse, including applicable tax benefits.

If you wish additional information please call your local PG&E office and ask to have a co-generation specialist contact you.

We look forward to working with you to develop electric generation sources that will reduce our dependence on diminishing fossil fuel reserves.

Sincerely,

PACIFIC GAS AND ELECTRIC COMPANY

Attachment

POWER SALES AGREEMENT
BETWEEN

AND
PACIFIC GAS AND ELECTRIC COMPANY

THIS AGREEMENT is entered into as of the _____ day of _____, 19____, by and between _____ ("Seller"), a _____, and PACIFIC GAS AND ELECTRIC COMPANY ("PGandE"), a corporation organized and existing under the laws of the State of California, hereinafter sometimes referred to collectively as "Parties" and individually as "Party".

RECITALS

WHEREAS:

- A. Seller owns or will own and operate a Co-generation* Facility or Alternative Fuel Generation Facility, and
- B. Seller wishes to sell, and PGandE wishes to purchase, electric power from the Facility,

NOW THEREFORE, in consideration of the mutual covenants and agreements hereinafter set forth, the Parties agree as follows:

ARTICLE 1 SALE OF POWER

- (a) Seller agrees to sell and deliver and PGandE agrees to purchase and accept delivery of the energy or energy and capacity as indicated below:

1. ENERGY - _____ output; and,
[Net] or [Surplus]

2. CAPACITY - _____
[Capacity Rating in kW] or
[Not Applicable]
in accordance with Option selected in Article 3 and described in Appendix C - Schedule of Capacity Purchase Prices and Conditions.

* Initial capitalization of words and phrases other than proper names indicates that these terms are defined in paragraph A-1 of Appendix A - Power Purchase General Terms and Conditions.

- (b) Seller may at any time reduce by any amount its capacity sale obligation by giving written notice thereof to PGandE, subject to possible repayments and payment adjustments as provided in Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction.
- (c) Seller's _____ ^{kW}
[Nameplate Rating of Generator(s)]
Facility located at _____ shall provide the energy or energy and capacity set forth above.
- (d) The scheduled operation date of the Seller's facility is _____.
(date)

ARTICLE 2 TERM OF AGREEMENT

This Agreement shall be binding upon execution and shall remain in effect for a term of _____ years from the Operation Date; provided, that Seller may at any time terminate this Agreement by giving written notice thereof to PGandE, subject to possible repayments and payment adjustments as provided in Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction.

ARTICLE 3 PURCHASE PRICE AND METHOD OF PAYMENT

(a) Energy

PGandE shall pay Seller for energy delivered and accepted in accordance with Appendix B - Schedule of Energy Purchase Prices.

(b) Capacity

Seller elects to be paid for capacity made available to PGandE according to:

(check one)

_____ Option #1

_____ Option #2

_____ Option #3

as set forth in Appendix C - Schedule of Capacity Purchase Prices and Conditions. The applicable capacity price for purposes of computing payments under such option is \$ _____ per kilowatt-year, except as may be adjusted upward, as provided in Appendix C - Schedule of Capacity Purchase Prices and Conditions, or as otherwise provided in Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction. [The capacity price is derived from Table 1, Appendix C.] PGandE's obligation to pay Seller for capacity furnished to PGandE shall commence as of the Operation Date.

ARTICLE 4 NOTICES

All written notices pursuant to Section A-19 of Appendix A - Power Purchase General Terms and Conditions shall be directed as follows:

to PGandE: _____

to Seller: _____

ARTICLE 5 DESIGNATED LOCATIONS

Where used in this Agreement, the following term shall mean:

Designated PGandE Switching Center:

Substation

ARTICLE 6 TERMS AND CONDITIONS

This agreement includes the following checked appendices which are attached and incorporated by reference herein:

(Check as appropriate)

- X Appendix A - Power Purchase General Terms and Conditions
- X Appendix B - Schedule of Energy Purchase Prices
- Appendix C - Schedule of Capacity Purchase Prices and Conditions
- Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction
- Appendix E - Simultaneous Purchase and Sale
- Appendix F - Insurance
- Appendix G - Special Facilities

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized representatives as of the last date hereinabove set forth:

SELLER

PACIFIC GAS AND ELECTRIC COMPANY

BY: _____

BY: _____

TITLE: _____

(Type Name)

TITLE: _____

(Type Name)

APPENDIX A

Power Purchase General Terms and Conditions

A-1. DEFINITIONS

Whenever used in this Agreement, Appendices and attachments hereto, the following terms shall have the following meanings:

"Adjusted Capacity Purchase Price" - The \$/kW-year purchase price from Table 1, Appendix C - Schedule of Capacity Purchase Prices and Conditions, of this Agreement for the period of Seller's actual performance.

"Alternate Fuel Generation" - For the purpose of this Agreement, generation from biomass, refuse-derived fuels and woodwaste, as generally provided in California Public Utilities Commission OII No. 26, Decision No. 91109 (December 19, 1979).

"Biomass Conversion" - The process of conversion of plant materials such as woodwaste, rice hulls, walnut shells, etc., into electricity or energy. (CPUC OII-26 Definition)

"Capacity Rating" - The maximum continuous ability of the Facility to generate electric energy, expressed in kilowatts, less station use and less step-up transformation losses to the high voltage bus at the generator site.

"Capacity Purchase Price Schedule" - The schedule of capacity prices published which sets forth the prices to be paid for capacity in \$/kW-year. This schedule will be adjusted periodically.

"Capacity Sale Reduction" - A reduction in the amount of capacity provided or to be provided under this Agreement.

"Co-generation" - The sequential production of electricity and heat, steam or useful work from the same fuel source. (CPUC OII-26 Definition).

"Contract Capacity" - That capacity identified in Article 1(a)(2) of this Agreement except as otherwise changed as provided herein.

"Contract Capacity Price" - The price in \$/kW-year set forth in Article 3(b) of this Agreement.

"Contract Termination" - The early termination of this Agreement.

"Current Capacity Price" - The \$/kW-year capacity purchase price from the schedule of capacity purchase prices being published by PGandE at the time of termination or reduction of Contract Capacity.

"Designated PGandE Switching Center" - That Substation identified in Article 5 of this Agreement.

"Dispatchable" - That condition of the Facility whereby through engineering design, installed equipment, and operating conditions and procedures, the Facility may be called upon by PGandE, in a manner mutually agreed upon by the Parties, for operation at any time.

"Facility" - That generation facility described in Article 1 of this Agreement.

"Forced Outage" - Any outage caused by mechanical or electrical equipment failure that either fully or partially curtails the electrical output of the Facility.

"Interconnection Facilities" - All facilities required to be installed solely to interconnect and deliver power from Seller's generation to PGandE's system including, but not limited to connection, transformation, switching metering and safety equipment. Interconnection Facilities shall also include any necessary additions and/or reinforcements by PGandE to PGandE's system.

"Minimum Requirements" - Seller's requirements set forth in Paragraph C-2 of Appendix C - Schedule of Capacity Purchase Prices and Conditions.

"Net Energy Output" - The gross output a Seller's generating Facility produces in kilowatt hours, less station use and less step-up transformation losses to the high voltage bus at the generator site.

"Operation Date" - The day commencing at 0001 hours, following the day during which all features and equipment of Facility have reached a degree of completion and reliability, such that they are capable of operating simultaneously to deliver power continuously into PGandE's system; provided, that the Operation Date may occur only after such degree of completion and reliability has been demonstrated to PGandE's satisfaction by operation for a period not to exceed three months.

"Prudent Electrical Practices" - Those practices, methods and equipment, as changed from time to time, that are commonly used in prudent electrical engineering and operations to operate electric equipment lawfully and with safety, dependability, efficiency and economy.

"Refuse-Derived Fuels" - Fuels derived from municipal waste used as a fuel for electric energy production or low BTU gases from sewage treatment plants for use in turbines. (CPUC OII-26 Definition)

"Special Facilities" - Interconnection Facilities furnished by PGandE at Seller's request or because such facilities are necessary additions and/or reinforcements to PGandE's system.

"Surplus Energy Output" - The gross output a Seller's generating facility produces in kilowatt hours, less station use, less any other use by the Seller and less step-up transformation losses to the high voltage bus at the generation site.

"System Protection Facilities" - The equipment required to protect (1) PGandE's system and its customers from faults occurring at the Facility, and (2) the Facility from faults occurring on the PGandE system or on the systems of others to which it is directly or indirectly connected.

"Term of Agreement" - The period of time during which this Agreement will be in effect, as provided in Article 2 of this Agreement.

A-2. ELECTRIC SERVICES SUPPLIED BY PGandE

This Agreement does not provide for any electric services by PGandE to Seller. If Seller requires supplemental or standby services from PGandE, Seller shall enter into separate contract arrangements with PGandE in accordance with PGandE's applicable electric tariffs on file with and authorized by the California Public Utilities Commission.

A-3. CONSTRUCTION

A-3.1 Land Rights:

Seller hereby grants to PGandE for the term of this Agreement all necessary rights of way and easements to install, operate, maintain, replace and remove PGandE's metering and other Special Facilities, including adequate and continuing access rights on property of Seller and Seller agrees to execute such other grants, deeds or documents as PGandE may require to enable it to record such rights of way and easements. If any part of PGandE's facilities are to be installed on property owned by other than Seller, Seller shall, if PGandE is unable to do so without cost to PGandE, procure from the owners thereof, all necessary permanent rights of way and easements for the construction, operation, maintenance and replacement of PGandE's facilities upon such property in a form satisfactory to PGandE. In the event Seller is unable to secure them (i) by condemnation proceedings or (ii) by other means at such cost as may be agreeable to Seller, Seller shall reimburse PGandE for all costs incurred by PGandE in securing such rights.

A-3.2 Facility And Equipment Design And Construction:

Seller shall design, construct, install, own, operate and maintain the Facility and all equipment needed to generate and deliver energy or energy and capacity specified herein, except for any Special Facilities constructed, installed and maintained by PGandE pursuant to Appendix G -- Special Facilities. Such Facility and equipment shall meet all requirements of applicable codes and all standards of Prudent Electrical Practice. Seller also agrees to meet reasonable PGandE requirements for Seller's Facility and equipment. Seller shall submit all its Facility and equipment specifications to PGandE for review prior to connecting its Facility and equipment to PGandE's system. PGandE's review of Seller's specifications shall not be construed as confirming nor endorsing the design nor as any warranty of safety, durability or

reliability of the Facility or any of the equipment. PGandE shall not, by reason of such review or failure to review, be responsible for strength, details of design, adequacy or capacity of Seller's Facility or equipment, nor shall PGandE's acceptance be deemed to be an endorsement of any Facility or equipment. Seller agrees to change its Facility and equipment as may be reasonably required by PGandE to meet changing requirements of PGandE's system. Seller shall give notice to PGandE at three-month intervals of the estimated date of initial power deliveries.

A-3.3 Interconnection Facility Construction And Meter Installation:

Seller shall construct, install, own and maintain Interconnection Facilities as required for PGandE to receive energy or energy and capacity from Seller's Facility. Seller's Interconnection Facilities shall be of a size to accommodate the delivery of the energy or energy and capacity designated in Article 1(a) of this Agreement. In the event it is necessary for PGandE to install Special Facilities or other Interconnection Facilities or to reinforce its system for purposes of this Agreement, Seller shall reimburse PGandE its costs in accordance with the terms and conditions of Appendix G -- Special Facilities. At Seller's request, PGandE shall provide, install and maintain meters at a mutually agreed upon designated location to record and indicate the integrated demand for each hour and to measure kilowatt-hours. Meters for measurement of reactive volt-ampere hours shall be provided. PGandE may also install secondary meters, as appropriate, at a location within Seller's Facility, agreed to by both Parties, to enable Seller to make daily telephone reports to be delivered pursuant to paragraph A-4. All meter equipment, installation, ownership and administration costs therefor shall be borne by Seller, including costs incurred by PGandE for inspecting and testing such equipment, all as estimated by PGandE and quoted to Seller.

A-4. OPERATION

A-4.1 Facility And Equipment Operation And Maintenance:

Seller shall operate and maintain its Facility and equipment according to Prudent Electrical Practices and shall generate such reactive power as may be reasonably necessary to maintain voltage levels and reactive area support as instructed by PGandE's system dispatcher or his designated representative. If Seller is unable or unwilling to provide such reactive power, PGandE may do so at Seller's expense.

A-4.2 Deliveries:

Seller shall deliver the energy or energy and capacity designated above, at the point where Seller's electrical conductors contact those of PGandE's at the transmission side of the high voltage disconnect, or at such other point as the Parties may agree.

A-4.3 Communications:

PGandE and Seller shall maintain operating communications through PGandE's designated Substation. The operating communications shall include, but not be limited to system paralleling or separation, scheduled and unscheduled shutdowns, equipment clearances and daily load reports.

A-4.4 Meters:

All meters used to determine the billing hereunder shall be sealed and the seals shall be broken only upon occasions when the meters are to be inspected, tested or adjusted.

PGandE shall, at Seller's expense, inspect and test all meters upon their installation and at least once every two years thereafter. If requested to do so by Seller, PGandE shall inspect or test a meter more frequently than every two years, but the expense of such inspection or test shall be paid by Seller unless upon being inspected or tested the meter is found to register inaccurately by more than two percent of full scale. Each Party shall give reasonable notice of the time when any inspection or test shall take place to the other Party, and that Party may have representatives present at the test or inspection. If a meter is found to be inaccurate or defective, it shall be adjusted, repaired or replaced, at Seller's expense, in order to provide accurate metering.

If a meter fails to register, or if the measurement made by a meter during a test varies by more than two percent from the measurement made by the standard meter used in the test, adjustment shall be made correcting all measurements made by the inaccurate meter for:

- (1) the actual period during which inaccurate measurements were made, if the period can be determined, or if not

- (2) the period immediately preceding the test of the meter equal to one-half the time from the date of the last previous test of the meter; provided, that the period covered by the correction shall not exceed six months.

Seller shall read the secondary meters daily and shall report the hourly readings and daily energy readings to PGandE's nearest switching center, currently the Substation designated in Article 5 of this Agreement, by telephone at an agreed upon time.

Seller with power deliveries greater than 10 MW shall telemeter the output information to PGandE's switching center designated in Article 5 of this Agreement.

Each Party, after reasonable notice to the other Party, shall have the right of access to all metering and related records.

A-5. BILLING

PGandE shall send a statement to Seller on or after the 20th day of the monthly billing period showing the kilowatt capacity, if any, and kilowatt-hours delivered to PGandE during the previous monthly billing period. Seller shall use this statement to compute charges for energy or energy and capacity delivered to PGandE. Seller shall then send a monthly billing statement to PGandE which states the energy or energy and capacity charges.

A-6. PAYMENT

PGandE shall make payment to Seller on or before the 15th day after the billing statement is received by PGandE. Where the 15th day falls on a Saturday, Sunday or holiday, the payment shall be due on the next following business day.

A-7. ADJUSTMENTS

In the event adjustments to billing statements are required as a result of corrected measurements made by inaccurate meters, the Parties shall use the corrected measurements described in paragraph A-4.4 to recompute the amounts due from or to PGandE for the energy or energy and capacity delivered under this Agreement during the period of inaccuracy. If the total amount, as recomputed, due from a Party for the period of inaccuracy varies from the total amount due as previously computed, and payment of the previously computed amount has been made, the difference in the amounts shall be paid to the Party entitled to it within

30 days after the paying Party is notified of the recomputation.

A-8. CHANGES IN CAPACITY RATING

Either Party may request, when it reasonably appears that the Capacity Rating of Seller's Facility may have changed for any reason including but not limited to a change in the steam supply, that a new Capacity Rating be determined.

A-9. CONTINUITY OF SERVICE

PGandE shall not be obligated to accept, and PGandE may require Seller to curtail, interrupt or reduce deliveries of energy or energy and capacity in order to construct, install, maintain, repair, replace, remove, investigate or inspect any of its equipment or any part of its system or if it determines that curtailment, interruption or reduction is necessary because of emergencies, forced outages, operating conditions on its system or as otherwise required by Prudent Electrical Practices. PGandE shall not be obligated to accept, and may require Seller to curtail, interrupt or reduce deliveries of energy or energy and capacity (1) whenever PGandE can obtain energy from another source, other than a PGandE fossil fueled plant, at a cost less than the price paid to Seller, (2) during any period when PGandE can generate or purchase an equivalent replacement amount of electric energy generated from renewable resources (including, but not limited to, solar, wind, biomass, geothermal, and hydro) or from plants designated for operation to minimize air pollution, or (3) during periods of minimum system operations; provided, that PGandE shall take or be prepared to take energy or energy and capacity from Seller for not less than 8,160 hours of each calendar year.

In the event of a force majeure, Seller shall not be obligated to deliver, and may curtail, interrupt or reduce deliveries of energy to PGandE and PGandE shall not be obligated to accept and may require Seller to curtail, interrupt or reduce deliveries of energy.

Except in case of emergency, in order not to interfere unreasonably with the other Party's operations, the curtailing, interrupting or reducing Party shall give the other Party reasonable prior notice of any curtailment, interruption or reduction, the reason for its occurrence and its probable duration. Seller always shall notify PGandE promptly of any complete or partial Facility outage.

A-10. . FORCE MAJEURE

The term "force majeure" as used herein, means unforeseeable causes beyond the reasonable control of and without the fault or negligence of the Party claiming force majeure.

If either Party because of force majeure is rendered wholly or partly unable to perform its obligations under this Agreement, except for the obligation to make payments of money, that Party shall be excused from whatever performance is affected by the force majeure to the extent so affected provided that:

- (a) the non-performing Party, within two weeks after the occurrence of the force majeure, gives the other Party written notice describing the particulars of the occurrence;
- (b) the suspension of performance is of no greater scope and of no longer duration than is required by the force majeure;
- (c) no obligations of either Party which arose before the occurrence causing the suspension of performance are excused as a result of the occurrence; and
- (d) the non-performing Party uses its best efforts to remedy its inability to perform. This subparagraph shall not require the settlement of any strike, walkout, lockout or other labor dispute on terms which, in the sole judgment of the Party involved in the dispute, are contrary to its interest. It is understood and agreed that the settlement of strikes, walkouts, lockouts or other labor disputes shall be entirely within the discretion of the Party having the difficulty.

A-11. INDEMNITY

Each Party shall indemnify the other Party, its officers, agents, and employees against all loss, damage, expense and liability to third persons for injury to or death of person or injury to property, proximately caused by the indemnifying Party's construction, ownership, operation, or maintenance of, or by failure of, any of such Party's works or facilities used in connection with this Agreement. The indemnifying Party shall, on the other Party's request, defend any suit asserting a claim covered by this indemnity. The indemnifying Party shall pay all costs that may be incurred by the other Party in enforcing this indemnity.

A-12. LIABILITY; DEDICATION

Nothing in this Agreement shall be construed to create any duty to, any standard of care with reference to or any liability to any person not a Party to this Agreement.

Neither party shall be liable to the other for damages caused to the facilities of the other by reason of the operation, faulty operation, or nonoperation of the other's facilities.

No undertaking by one Party to the other under any provision of this Agreement shall constitute the dedication of that Party's system or any portion thereof to the other Party or to the public, nor affect the status of PGandE as an independent public utility corporation, or Seller as an independent individual or entity.

A-13. SEVERAL OBLIGATIONS

Except where specifically stated in this Agreement to be otherwise, the duties, obligations and liabilities of the Parties are intended to be several and not joint or collective. Nothing contained in this Agreement shall ever be construed to create an association, trust, partnership, or joint venture or impose a trust or partnership duty, obligation or liability on or with regard to either Party. Each Party shall be individually and severally liable for its own obligations under this Agreement.

A-14. WAIVER

Any waiver at any time by either Party of its rights with respect to a default under this Agreement, or with respect to any other matters arising in connection with this Agreement, shall not be deemed a waiver with respect to any subsequent default or other matter.

A-15. ASSIGNMENT

Neither Party shall voluntarily assign its rights nor delegate its duties under this Agreement, or any part of such rights or duties, without the written consent of the other Party, except in connection with the sale or merger of a substantial portion of its properties including Interconnection Facilities which it owns, and any such assignment or delegation made without such written consent shall be null and void. Consent for assignment will not be withheld unreasonably.

A-16. CAPTIONS

All indexes, titles, subject headings, section titles and similar items are provided for the purpose of reference and convenience and are not intended to be inclusive, definitive or to affect the meaning of the contents or scope of this Agreement.

A-17. CHOICE OF LAWS

This Agreement shall be construed and interpreted in accordance with the laws of the State of California, excluding any choice of law rules which may direct the application of the laws of another jurisdiction.

A-18. GOVERNMENTAL JURISDICTION AND AUTHORIZATION

This Agreement is subject to the jurisdiction of those governmental agencies having control over either Party or this Agreement. This Agreement shall not become effective until all required governmental authorizations and permits are first obtained and copies thereof are submitted to PGandE; provided, that this Agreement shall not become effective unless it, and all provisions thereof, is authorized and permitted by such governmental agencies without change or condition.

This Agreement shall at all times be subject to such changes by such governmental agencies, and the Parties shall be subject to such conditions and obligations, as such governmental agencies may, from time to time, direct in the exercise of their jurisdiction. Both Parties agree to exert their best efforts to comply with all applicable rules and regulations of all governmental agencies having control over either Party or this Agreement. The Parties shall take all reasonable action necessary to secure all required governmental approval of this Agreement in its entirety and without change.

If after this Agreement becomes effective, any governmental agency having control over either Party or this Agreement requires any change in this Agreement, or imposes any condition or obligation on either Party, which either, in its sole and absolute discretion, deems unreasonably burdensome, such Party may terminate this Agreement.

A-19. NOTICES

Any notice, demand or request required or permitted to be given by either Party to the other and any instrument required or permitted to be tendered or delivered

by either Party to the other may be so given, tendered or delivered, as the case may be, by depositing the same in any United States Post Office with postage prepaid, for transmission by certified or registered mail, addressed to the Party, or personally delivered to the Party, at the address in article 4 of this Agreement. Changes in such designation may be made by notice similarly given.

APPENDIX B

Schedule of Energy Purchase Prices

PGandE shall pay Seller for energy delivered by Seller to PGandE at prices which will be based on PGandE's average quarterly cost of incremental fuel, which quarterly price shall be published by PGandE as provided by California Public Utilities Commission OII-26, Decision No. 91109 (December 19, 1979). The energy price so established shall be applied for periods as follows:

TABLE A

Average Cost Quarter Used	Months to Which Energy Price Applies
January - March	May - July
April - June	August - October
July - September	November - January
October - December	February - April

Energy prices will be applied to meter readings taken during the months indicated in the right-hand column above.

TABLE B

The energy prices to be applied to meter readings in February through April 1980*, are:

On-Peak Period	4.496 cents per kWh
Partial-Peak Period	4.250 cents per kWh
Off-Peak Period	3.794 cents per kWh

* See Note on page B-3.

APPENDIX B

TABLE C

	<u>Monday</u> <u>through</u> <u>Friday*</u>	<u>Saturdays*</u>	<u>Sundays</u> and <u>Holidays</u>
<u>Period A</u> (May 1 to September 30)			
On-Peak	12:30 p.m. to 6:30 p.m.		
Partial-Peak	8:30 a.m. to 12:30 p.m. 6:30 p.m. to 10:30 p.m.	8:30 a.m. to 10:30 p.m.	
Off-Peak	10:30 p.m. to 8:30 a.m.	10:30 p.m. to 8:30 a.m.	12:00 a.m. to 12:00 a.m.
<u>Period B</u> (October 1 to April 30)			
On-Peak	4:30 p.m. to 8:30 p.m.		
Partial-Peak	8:30 p.m. to 10:30 p.m. 8:30 a.m. to 4:30 p.m.	8:30 a.m. to 10:30 p.m.	
Off-Peak	10:30 p.m. to 8:30 a.m.	10:30 p.m. to 8:30 a.m.	12:00 a.m. to 12:00 a.m.

* Except the following holidays: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving and Christmas Day, as said days are specified in Public Law 90-363 (U.S.C.A. Section 6103).

This table is subject to change to accord with the on-peak, partial-peak, and off-peak period as defined in PGandE's own rate schedules for the sale of electricity to its large industrial customers.

NOTE FOR READER

The following is for information purposes only. Other prices may be in effect for the remainder of 1980.

The energy prices, based on the quarterly average energy cost for October through December 1979, if applied throughout 1980, would be:

	<u>Period A</u> May 1 to September 30	<u>Period B</u> October 1 to April 30
On-Peak	4.682¢/kWh	4.496¢/kWh
Partial-Peak	4.504	4.250
Off-Peak	3.878	3.794

APPENDIX C

Schedule of Capacity Purchase Prices and Conditions

C-1 General

This Appendix C shall apply if Seller has elected in Article 1(a)(2) of this Agreement to make available (deliver) Contract Capacity to PGandE. It establishes conditions and prices under which PGandE shall pay for such Contract Capacity.

C-2 Minimum Requirements

In order to qualify for a capacity payment, the following provisions must be met:

1. The Contract Capacity for payment purposes may not exceed the lowest Capacity Rating in any of the three peak months on PGandE's area system, which are presently the months of June, July and August.
2. The Contract Capacity must be available¹ for all of the on-peak hours² in the peak months on PGandE's area system, which are presently the months of June, July and August, subject to an allowance of 20 percent of those on-peak hours for forced outages.
3. Scheduled Outages must be performed between November and April unless otherwise agreed as provided in paragraph C-4 of this Appendix.

¹ As used herein "available" means either Dispatchable by PGandE or actually delivered to PGandE.

² On-peak, partial-peak and off-peak hours are defined on Table C, Appendix B - Schedule of Energy Purchase Prices.

C-3 Payment Options

The Seller has three options for calculation of capacity payments, and Seller has made its selection in Article 3(b) of this Agreement. The three options are as follows:

Option #1

(Payment in Dollars per Kilowatt-month)

The Facility will be fully Dispatchable by PGandE. Seller must demonstrate that the Facility is fueled by a reliable fuel supply and adequate fuel storage is available to deliver power as requested by PGandE's system dispatcher. Payments will be made in twelve equal monthly amounts based on the Contract Capacity Prices set forth in Article 3(b) of this Agreement multiplied by the Contract Capacity.

Option #2

(Payment in Dollars per Kilowatt-month)

Payment each month will be based on the "monthly delivered capacity", but will not exceed the Contract Capacity.

As used herein, "monthly delivered capacity" shall be equal to FACTOR multiplied by the Contract Capacity. FACTOR is determined according to the following formula:

$$\text{FACTOR} = P \times (1.0 - \frac{M}{D})$$

where $P = \frac{A}{C \times (B-S) \times (1-F)}$

where

A = Kilowatt-hours delivered on-peak and partial-peak

C = Contract Capacity in kilowatts

B = On-peak and partial-peak hours during the month

S = On-peak and partial-peak hours Facility is out of service on scheduled maintenance

M = The number of days during month Facility is out of service on scheduled maintenance

D = The number of days in the month

F = The fraction of on-peak and partial-peak hours allowed for Forced Outage. For the purpose of this Agreement, F equals 0.2.

P = Performance Factor (not to exceed 1.0)

The payment for a month is determined by multiplying the Contract Capacity Price as set forth in Article 3(b) of this Agreement by the FACTOR, as above determined, and then multiplying that product by the following allocation factor:

Allocation Factors*

<u>Period A</u>	<u>Period B</u>
0.1172	0.0588

Option #3

(Payment in cents per Kilowatt-hour)

Payments will be based on the time differentiated energy deliveries by Seller. The payment in cents per kilowatt hour is determined by multiplying the Contract Capacity Price, as set forth in Article 3(b) of this Agreement by the following allocation factors:

Allocation Factors*

	<u>Period A</u>	<u>Period B</u>
On-Peak	0.03357	0.02022
Partial-Peak	0.02323	0.00893
Off-Peak	0.00553	0.00476

Payment in any month will not exceed the maximum payment available under Option 2 assuming delivery of the full Contract Capacity.

* These allocation factors will be subject to change by PGandE based on PGandE's marginal capacity cost allocation, as determined in general rate case proceedings before the CPUC. Periods A and B are defined in Table C, Appendix B - Schedule of Energy Purchase Prices.

GENERAL REQUIREMENTS AND INFORMATION

C-4 Scheduled Outages

To qualify for capacity payments, scheduled outages for maintenance must be performed within Period B (excluding the first month) unless otherwise agreed to by PGandE. Seller shall provide the PGandE system dispatcher with the scheduled outage dates (start and finish) at least six months in advance. These dates shall not be changed without written approval by PGandE.

Capacity payments will continue during the scheduled maintenance period and will be equal to the product of the average daily capacity payments of the preceding month and the number of days of actual outage for scheduled maintenance. Such payments during scheduled outage shall not be made for more than 35 days in any twelve-month period.

C-5 Adjustments to Contract Capacity

Seller may derate the Contract Capacity at any time. The derated capacity will be subject to Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction.

Seller may increase the Contract Capacity with the approval of PGandE and receive payment for the additional capacity in accordance with the then applicable capacity purchase prices.

PGandE may derate the Contract Capacity as a result of appropriate tests, studies or prior performance. The derated capacity will be subject to Appendix D - Adjustment of Capacity Payments in the Event of Termination or Reduction.

C-6 Adjustment to Contract Capacity Price

The Contract Capacity Price will be adjusted upward to the highest capacity price for the scheduled operation date and agreement term published by PGandE between the date the Agreement is executed and the scheduled operation date set forth in Article 1(d) of this Agreement. The applicable Capacity Price schedule shall be attached to this Agreement and shall supersede Table 1 of Appendix C.

Table 1
Capacity Price
(Levelized \$/kW-yr)

Operation Date Year	Term of Agreement												
	1	2	3	4	5	6	7	8	9	10	15	20	30
1980	-	-	-	55	56	57	59	60	61	62	68	73	81
1981	-	-	57	58	60	61	62	63	65	66	72	77	85
1982	-	59	60	61	63	64	65	67	68	69	75	81	89
1983	60	62	63	65	66	67	69	70	71	73	79	85	94
1984	63	65	66	68	69	71	72	74	75	76	83	89	98
1985	66	68	70	71	73	74	76	77	79	80	87	93	103

APPENDIX D

Adjustment of Capacity Payments in the Event of Termination or Reduction

D-1 General Provisions

- A. This Appendix shall be applicable in the event there is a Contract Termination or a Capacity Sale Reduction and Seller is receiving capacity payments.
- B. The Parties agree that the amount of the payment which PGandE is to make to Seller for capacity which Seller makes available to PGandE is based on the agreed value to PGandE of Seller's performance of his capacity obligations during the full period of the Term of Agreement. The Parties further agree that in the event PGandE does not receive such full performance by reason of a Contract Termination or a Capacity Sale Reduction, (1) PGandE shall be deemed damaged by reason thereof, (2) it would be impracticable or extremely difficult to fix the actual damages to PGandE resulting therefrom, (3) the refund and payments as provided in paragraphs D-2 through D-5, as applicable, are in the nature of adjustments in capacity prices and liquidated damages, and not a penalty, and are fair and reasonable, and (4) such refunds and payments represent a reasonable endeavor by the Parties to estimate a fair compensation for the reasonable losses that would result from such termination or reduction.
- C. In the event of a Capacity Sales Reduction, the quantity by which the Contract Capacity is reduced shall be used to calculate the payments due PGandE in accordance with Paragraphs D-2 through D-5, as applicable.
- D. Seller shall be invoiced by PGandE for all refunds and payments due under this appendix and Appendix G - Special Facilities, if applicable, and shall pay such amounts to PGandE within 30 days after receipt of said invoice.
- E. PGandE shall have the right to offset any amounts due it against any present or future payments due Seller.
- G. Notices of termination shall be made in accordance with Section A-19 of Appendix A - Power Purchase General Terms and Conditions.

D-2 Termination Resulting from Governmental Action

If either Party terminates either this Agreement, or all or a part of the Contract Capacity thereof, under the provisions of Section A-18 (changes in the Agreement required by any governmental agency), Appendix A - Power Purchase General Terms and Conditions, Seller shall refund to PGandE an amount equal to one-half the difference between the capacity payments already paid by PGandE (which were based on the original Term of Agreement) and the total capacity payments based on the period of Seller's actual performance using the Adjusted Capacity Purchase Price.

D-3 Termination With Prescribed Notice

In the event Seller terminates this entire Agreement, or all or part of the Contract Capacity thereof, with the following prescribed written notice:

<u>Contract Capacity</u>	<u>Length of Notice</u>
Under 25,000 kw	12 months
25,001 to 50,000 kw	36 months
50,001 to 100,000 kw	48 months
over 100,000 kw	60 months

- A. Seller shall refund to PGandE an amount equal to the difference between the capacity payments already paid by PGandE (based on the original Term of Agreement) and the total capacity payments based on the period of Seller's actual performance using the Adjusted Capacity Purchase Price.
- B. The Adjusted Capacity Purchase Price shall be calculated at the time the termination notice is received, and PGandE shall make capacity payments for the remainder of Seller's performance period at that price.

D-4 Termination Without Prescribed Notice

If Seller terminates this Agreement, or all or a part of the Contract Capacity thereof, without the notice prescribed in D-3:

- A. Seller shall refund to PGandE an amount equal to the difference between the capacity payments already paid by PGandE (which were based on the original Term of Agreement) and the total capacity payments based on the period of Seller's actual performance using the Adjusted Capacity Purchase Price; and
- B. Seller shall pay PGandE a one-time payment equal to the difference between the Current Capacity Price on the date of termination, for a term equal to the balance of the Term of Agreement, and the Contract Capacity Price, multiplied by

the Contract Capacity. This payment will be pro-rated for the length of notice given, if any. The pro-ration factor shall be one minus the ratio of the actual number of months notice given and the prescribed length of notice (as set forth in D-3). In the event that the Current Capacity Price is less than the Contract Capacity Price, no payment under this paragraph D-4(B) shall be due either Party.

D-5 Termination Due to Seller's Failure to Perform

Except in the event of force majeure as defined in paragraph A-10 of Appendix A - Power Purchase General Terms and Conditions, in the event of failure of Seller to meet the Minimum Requirements set forth in paragraph C-2 of Appendix C - Schedule of Capacity Purchase Prices:

- A. PGandE shall immediately suspend the capacity payments to Seller for a probationary period not to exceed 14 months.
- B. If Seller meets or satisfies PGandE that it can meet its Minimum Requirements during the probationary period, PGandE shall make a retroactive capacity payment for the probationary period, and reinstate regular capacity payments.
- C. If Seller fails to meet its Minimum Requirements during the probationary period, PGandE may derate the Contract Capacity appropriately or terminate the capacity purchases. In either case, the quantity by which the capacity is reduced shall be considered terminated without prescribed notice (as provided in paragraph D-4).

APPENDIX E

Simultaneous Purchase and Sale

PGandE shall purchase, except as provided in Paragraph A-9 of Appendix A - Power Purchase General Terms and Conditions, Seller's entire Net Energy Output and Contract Capacity, if any, at the prices stated in Appendix B - Schedule of Energy Purchase Prices and Appendix C - Schedule of Capacity Purchase Prices and Conditions as applicable; and, PGandE shall simultaneously supply all of Seller's electric service requirements under separate agreement at applicable filed rates.

During PGandE system emergencies, when Seller's Facility is operating, Seller agrees to provide its Contract Capacity to PGandE's system.

Provisions relating to curtailment or interruption as part of implementation of a statewide Electrical Emergency Plan approved by the California Public Utilities Commission will be observed by PGandE for all electrical service supplied by PGandE.

APPENDIX F

Insurance

Seller shall be required to maintain insurance as indicated below:

F-1 WORKERS' COMPENSATION

(Yes or No)

Seller shall furnish PGandE a certificate of workers' compensation insurance or self-insurance indicating compliance with the Labor Code of California and providing for 30 days' written notice to PGandE prior to cancellation of such insurance.

F-2 LIABILITY

(Yes or No)

Seller shall maintain in effect during the term of this Agreement insurance for both bodily injury and property damage liability, including automobile liability, in per occurrence limits of not less than \$ _____.

Such insurance shall include:

_____ assumption of contractual liability,

_____ an endorsement naming PGandE as an additional insured insofar as work performed under this Agreement is concerned,

_____ a severability of interest clause, and

_____ provide that notice shall be given to PGandE at least 30 days prior to cancellation or material change in the form of such policies.

Seller shall furnish PGandE, by delivering to the Manager, Insurance Department, Room 842, 77 Beale Street, San Francisco, California 94106, prior to commencing performance hereof but not less than 30 days before the scheduled date of initial power deliveries (Article 1 of this Power Sales Agreement), certificates of insurance together with the endorsements required therein. PGandE shall have the right to inspect the original policies of such insurance.

APPENDIX G

Special Facilities

(If Special Facilities, as provided in this Agreement, are required, Seller and PGandE shall enter into a separate agreement, which will be substantially in the form of PGandE's current Special Facilities agreement referred to in PGandE's Electric Rule No. 2, providing for Seller to reimburse PGandE its costs for such facilities. Such agreement will be deemed to become a part of this agreement as Appendix G.)

APPENDIX B

Schedule of Energy Purchase Prices

PGandE shall pay Seller for energy delivered by Seller to PGandE at prices which will be based on PGandE's average quarterly cost of incremental fuel, which quarterly price shall be published by PGandE as provided by California Public Utilities Commission OII-26, Decision No. 91109 (December 19, 1979). The energy price so established shall be applied for periods as follows:

TABLE A

<u>Average Cost Quarter Used</u>	<u>Months to Which Energy Price Applies</u>
January - March	May - July
April - June	August - October
July - September	November - January
October - December	February - April

Energy prices will be applied to meter readings taken during the months indicated in the right-hand column above.

TABLE B

The energy prices to be applied to meter readings in May through July 1980*, are:

On-Peak Period	5.675 cents per kWh
Partial-Peak Period	5.459 cents per kWh
Off-Peak Period	4.700 cents per kWh

* See Note on page B-3.

TABLE C

	<u>Monday</u> <u>through</u> <u>Friday*</u>	<u>Saturdays*</u>	<u>Sundays</u> and <u>Holidays</u>
<u>Period A</u> (May 1 to September 30)			
On-Peak	12:30 p.m. to 6:30 p.m.		
Partial-Peak	8:30 a.m. to 12:30 p.m. 6:30 p.m. to 10:30 p.m.	8:30 a.m. to 10:30 p.m.	
Off-Peak	10:30 p.m. to 8:30 a.m.	10:30 p.m. to 8:30 a.m.	12:00 a.m. to 12:00 a.m.
<u>Period B</u> (October 1 to April 30)			
On-Peak	4:30 p.m. to 8:30 p.m.		
Partial-Peak	8:30 p.m. to 10:30 p.m. 8:30 a.m. to 4:30 p.m.	8:30 a.m. to 10:30 p.m.	
Off-Peak	10:30 p.m. to 8:30 a.m.	10:30 p.m. to 8:30 a.m.	12:00 a.m. to 12:00 a.m.

* Except the following holidays: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving and Christmas Day, as said days are specified in Public Law 90-363 (U.S.C.A. Section 6103).

This table is subject to change to accord with the on-peak, partial-peak, and off-peak period as defined in PGandE's own rate schedules for the sale of electricity to its large industrial customers.

NOTE FOR READER

The following is for information purposes only. Other prices may be in effect for the remainder of 1980.

The energy prices, based on the quarterly average energy cost for January through March 1980, if applied throughout 1980, would be:

	<u>Period A</u> May 1 to <u>September 30</u>	<u>Period B</u> October 1 to <u>April 30</u>
On-Peak	5.675¢/kWh	5.450¢/kWh
Partial-Peak	5.459	5.150
Off-Peak	4.700	4.599

PACIFIC GAS AND ELECTRIC COMPANY

PG&E + 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

H. M. HOWE
CHIEF SITING ENGINEER

August 8, 1980

Mr. M. D. Brown
Brown, Vence and Associates
124 Spear Street
San Francisco, California 94105

Dear Mr. Brown:

Pacific Gas and Electric Company (PG&E) has reviewed your plans and specifications for the Berkeley Resource Recovery Project, transmitted by your letter dated May 21, 1980, and has developed preliminary estimates of gas interconnection costs and Special Facilities Requirements as per your request.

A rough estimate for gas interconnection costs for your facility is \$3,000.

In reviewing your drawings to determine Special Facility requirements, the following comments were made:

For Relaying:

- 1) Circuit breaker 2 needs "normal" feeder relays--phase and ground. These line relays must see end-of-line on whatever circuit feeds the generator. (Overloading should not be relied upon.)
- 2) The 81 device has to trip for over as well as under frequency.
- 3) Clarify which relays trip which circuit breakers. The lack of suffix numbers with the devices makes it difficult to make this determination.
- 4) See attached System Interconnection and Protection Guidelines.

Mr. M. D. Brown

-2-

August 8, 1980

For Switching:

- 1) What circuit is this on? Fault duty?
- 2) Which equipment is PGandE's?
- 3) The "Primary Line Selector Switch" has to be break-before make. Is it?
- 4) No recording instruments are indicated (RTWM, etc.).

For Metering:

- 1) Your drawings E-1 and E-2 do not clearly define the plan for revenue metering of this facility. You should be clear well ahead of time whether you want a surplus or buy-sell power arrangement. Contact the PGandE division marketing representative early to assist in this determination.
- 2) Assuming surplus sales arrangement--provision of a primary line selector switch makes it impossible to connect the generator to the facility load while still being connected to the PGandE supplied service.
- 3) Assuming "buy-sell" sales arrangement--no provisions have been made for the generator auxiliary loads to be supplied by the generator. Only the "net" energy is supplied into the PGandE system.
- 4) Follow PGandE guidelines to determine needs for measuring meters, demand recorders and graphic instruments.

Should you have any questions, please contact me at (415)781-4211 (x3511) or Jeff Blee of my staff (x4936).

Sincerely,

J. G. MEYER
Supervising Engineer
Siting Department

Attachment

**Guidelines for Operating and Protecting
Co-Generation and Small Power Projects
to be Connected to the PGandE System**

**Pacific Gas and Electric Company
November 1978**

**Guidelines for Operating and Protecting
Co-Generation and Small Power Projects
to be Connected to the PGandE System**

These guidelines contain the minimum operating and protection requirements when considering the need of both the PGandE electric system and that of the co-generator or seller of excess energy. The guidelines describe how the customer's power, voltage, and maintenance schedules are to be integrated into PGandE's electric system operations.

Most commercially available generators will be equipped with adequate protection, excitation, voltage, and governor control systems. However, additional equipment may be required to permit parallel operation with the PGandE system. Although these guidelines provide a uniform approach for evaluating projects, each must be looked at on a case-by-case basis.

Minimum Operating and Protection Requirements

1.0 Line Protection

- 1.1 The line arrangement interconnecting a project with the PG&E system will vary. Each installation is unique and must be analyzed to determine specific operating and protection requirements.
- 1.2 Small generating plants may in some cases be connected to a distribution feeder with feeder protection at the distribution substation. No fuses, sectionalizers, or service restorers should be in the line between the distribution substation and the co-generator's high-voltage transformer bank, circuit breaker, or service restorer. A delta-wye grounded step-up bank may be necessary between the generator bus and the distribution feeder. A ground relay connected to a current transformer in the high-voltage neutral can be used to clear ground faults. Phase faults should be cleared by either bank overcurrent relays or generator overcurrent relays.
- 1.3 Delta-delta bank connection may be substituted for the delta-wye bank connection if the delta-wye bank connection is detrimental to the protection of the transmission or distribution system. In this case, a ground bank would be necessary with a current transformer in the bank neutral. Separate design standards are available for ground bank installations.
- 1.4 Installations connected to the transmission system will necessitate special protection consistent with the local transmission system configuration.
- 1.5 Generator protection must include generator overcurrent and phase current balance protection. This protection serves as backup for external line faults as well as for generator faults. The overcurrent relays should be a voltage restraint or impedance type relay.

2.0 Feeder Reclose Blocking

- 2.1 A potential transformer with the associated voltmeter and undervoltage relay must be installed on the line side of the feeder breaker to block both automatic and manual reclosing until the co-generator's unit has been separated from the line.
- 2.2 Co-generation projects connected to a transmission line may necessitate changes to the automatic restoration scheme or to the protective relays.

3.0 Automatic Synchronizing

- 3.1 Automatic synchronizing of the generator is required.
- 3.2 Manual synchronizing may be permitted only by qualified personnel during initial startup and for maintenance of the automatic synchronizer.

6.0 Reactive and Voltage Controls

- 6.1 The unit must be capable of following a reactive or voltage schedule.
- 6.2 Recording voltmeter charts will be necessary from system voltage.
- 6.3 Special voltage control requirements may be necessary for generators feeding directly into distribution circuits.
- 6.4 Generation unit auxiliaries must fully function with $\pm 10\%$ voltage deviation and $\pm 5\%$ frequency deviation.

7.0 Governing Equipment

- 7.1 Generators must be operated with free governors and have similar governing characteristics.
- 7.2 The governor characteristic must be adjusted to 5% (i.e., a 0.15 Hz change in system speed will call for a 5% change in unit loadings).
- 7.3 Governors are to be operated unrestrained to provide reduced generation in the event of excessive system frequency.

8.0 Generation Reporting

- 8.1 Metering at co-generation plants should include a means to read hourly values of unit power output and the midnight energy production for the previous 24-hour period. These values must be reported through the appropriate PGandE switching center at least once a day and on larger plants up to three times a day or when major changes in generator levels are made.
- 8.2 Metering for recording both incoming and outgoing reactive power flow shall be provided.

9.0 Unit Maintenance

- 9.1 Unit maintenance should be scheduled to be compatible with PGandE's load periods (i.e., during weekends or off-peak seasons of the year). Such schedule will be reflected in the contract between PGandE and the co-generator or seller of excess energy.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

COUNSELORS AND ATTORNEYS AT LAW

TELEPHONE 392-1122
AREA CODE 415

ELEVENTH FLOOR
600 MONTGOMERY STREET
SAN FRANCISCO, CALIFORNIA 94111

CABLE "ORRICK"
TELEX 34-0973

April 21, 1980

Mr. Robert H. Brickner
Gordian Associates Incorporated
1919 Pennsylvania Avenue, N.W.
Washington, D. C. 20006

Re: Berkeley Resource Recovery Project

Dear Mr. Brickner:

Your letter of April 1 to Michael Brown at Brown, Vence & Associates regarding the Berkeley Resource Recovery Project (the "Project") was recently referred to us. Under the instructions that we received earlier from Mr. Brown, some of the questions contained in your letter have already received considerable attention, while others cover fairly new issues. Brief answers to each of your questions are set forth below and, where applicable, more extensive discussion is included. The format of this letter corresponds to the sequence of questions contained in your letter to Mr. Brown.

We would like to remind you that the scope of research performed in order to respond to your questions reflects the needs of the current feasibility study phase. Further research would likely be necessary to expand and refine the analysis contained in this letter at the project implementation phase. Certain suggested areas of research are included in this letter. We would also like to point out that most of the engineering and technical assertions contained in this letter (e.g., the description of "baseload power plants") are as described to us by agency staff, and we have no means of confirming their accuracy. With this brief introduction, the answers to your inquiries are as follows:

(A) WHAT EXISTING LAWS OR PRECEDENTS EITHER ALLOW FOR OR INDICATE THAT THE CITY OF BERKELEY CAN OBTAIN OR CAUSE ALL THE SOLID WASTE GENERATED WITHIN ITS BOUNDARIES TO SHOW UP AT A SPECIFIC PLANTSITE (THE FLOW CONTROL ISSUE!)?

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 2

The City of Berkeley would be able to impose waste flow restrictions pursuant to its Home Rule power under Article XI, Section 6 of the California Constitution. The Federal District Court for the Northern District of Ohio recently upheld similar restrictions imposed by the City of Akron in the face of antitrust and constitutional challenges. Glenwillow Landfill, Inc. v. City of Akron, 14 E.R.C. 1013 (N.D. Ohio, December 14, 1979). Our analysis of the Akron case and the California statute suggests that waste flow restrictions imposed by a California charter city such as Berkeley would have at least as great a chance of success as similar restrictions imposed in Ohio.

The Akron case dealt solely with a challenge by a private waste hauler to waste flow restrictions imposed by the City of Akron. A separate problem faced by the City of Berkeley is whether the City can avoid allocation of solid waste produced within its borders to other resource recovery projects in the area by way of the county solid waste management plan. The City will need to work closely with Alameda County 1/, which will coordinate the efforts of the various projects, to ensure that its waste stream is not committed to other facilities.

DISCUSSION: The question of whether the City of Berkeley may restrict the flow of solid waste within the City by requiring that independent haulers carry waste to the proposed Project raises three issues: (1) whether the City has authority to impose such restrictions; (2) if so, whether such restrictions would be vulnerable to antitrust and constitutional attack; and (3) whether the City could avoid commitment of the waste stream to other regional resource recovery centers. As mentioned above, it appears that such restrictions would be within the authority of the City and would survive both antitrust and constitutional attack, but the City will need to work with Alameda County in order to ensure that the waste stream is not designated to other facilities.

1/ The Association of Bay Area Governments should also be consulted to ensure conformance with its regional plan.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 3

1. Authority of the City to impose
waste flow restrictions

Article XI, Section 6 of the California Constitution provides that charter cities shall have the right and power "to make and enforce all laws and regulations in respect to municipal affairs, subject only to the restrictions and limitations provided in their several charters, and in respect to other matters they shall be subject to and controlled by general laws." Section 115 of the Berkeley City Charter reserves to the City the full scope of this Home Rule power. Thus, so long as garbage collection is a municipal affair not restricted by the Charter, or is not in conflict with state law, the City is free to impose reasonable restrictions upon the waste flow within the City.

Prior to the passage of the Nejedly-Z'Berg-Dills Solid Waste Management and Resource Recovery Act of 1972, Government Code Section 66700, et seq. (the "Act"), solid waste management was considered to be a municipal affair immune to interference by the state. Matula v. Superior Court, 146 Cal.App.2d 93 (2d Dist. 1956). However, the Act reflects the state's interest in solid waste, by creating a "comprehensive state solid waste management and resource recovery policy" Government Code Section 66702. The Act avoids a complete shift of solid waste management to the state, by stating that, "[i]t is the intent of the Legislature that the primary responsibility for adequate solid waste management and planning shall rest with local government, with the state bearing primary responsibility for the development and maintenance of the state policy for solid waste management . . ." Government Code Section 66730. 2/ Government Code Section 66771 clearly marks the line between state and local regulation of solid waste, by stating that:

2/ Such local solid waste management and planning is to conform to the approved solid waste management plan prepared pursuant to Section 66780.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 4

Standards included in the state policy for solid waste management may include the location, design, operation, maintenance, and ultimate reuse of solid waste processing or disposal facilities, but shall not include aspects of solid waste handling or disposal which are solely of local concern and not determined by the Board to be of state-wide concern, such as, but not limited to, frequency of collections, means of collection and transportation, level of service, charges and fees, designation of territory served through franchises, contracts or government employees, and purely aesthetic considerations. (emphasis added).

Section 66732 further provides that:

No provision of this title or any ruling made pursuant thereto is a limitation on any of the following: (a) the power of a city, county, city and county, or district to adopt and enforce regulations, not in conflict therewith, imposing conditions, restrictions, or limitations with respect to the handling or disposal of solid waste.

Thus, the Act explicitly recognizes that, to the extent that city actions are solely of local concern, or are not in conflict with the Act, the City may still regulate the disposal of solid waste. As discussed below, city restrictions on waste flow probably meet both of these tests.

First, it would appear that a waste flow restriction requiring that waste generated within the City of Berkeley be deposited at the proposed project would fall within the scope of local concerns listed in Section 66771. Although such waste restrictions are not specifically included among the enumerated areas of local concern, such restrictions are similar to those areas, and are probably encompassed by "means of collection and transportation, designation of territory served through franchises, con-

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 5

tracts," etc. Thus, it is probable that limitations on the disposal of waste would fall within the domain of local concern.

More importantly, even if waste flow restrictions were found to be of state-wide concern, such restrictions are not in conflict with the Act. Section 66780.8 provides that:

(b) In defining the waste sources for a project, the county or counties involved shall ensure that, given current and reasonably anticipated source separation, recycling, and waste reduction efforts, the waste sources will furnish more than sufficient quantities of waste to maintain the project's economic feasibility for the life of the bonded indebtedness of the project. . . .

(c) All wastes generated by the waste sources, identified and defined pursuant to subdivisions (a) and (b), shall be specifically committed as necessary to the project, for the life of the bonded indebtedness of the project or until such time as the project permanently ceases to operate, whichever occurs first.

See also Government Code Section 66786. Thus, it is clearly contemplated in the Act that restrictions be imposed upon waste flow such that solid waste recovery projects can be financially viable. 3/

3/ Note that Section 66780.8 provides that the county, in the county solid waste management plan, shall require control of the waste stream. The county solid waste management plans are established pursuant to Government Code Section 66780, which shifts responsibility for solid waste planning from the cities to the counties. Thus, the City should be sure that

[footnote continued on page 6]

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 6

2. Potential antitrust and constitutional problems

Private waste haulers within the City of Berkeley might attempt to challenge waste flow restrictions as having anticompetitive effects violative of the antitrust laws, in particular Sherman Act Sections 1 and 2. However, the City would probably prevail on a defense that the waste flow restrictions would be exempt from the operation of the Sherman Act as state action under Parker v. Brown, 317 U.S. 341 (1943).

The state action exemption was recently narrowed, as it relates to the actions of municipalities, by the Supreme Court's decision in City of Lafayette v. Louisiana Power and Light Co., 435 U.S. 389, 98 S.Ct. 1123 (1978). The Supreme Court in Lafayette held that the state action exemption does not automatically apply to anticompetitive actions of municipalities. However, municipal actions fall within the state action exemption when "it is found 'from the authority given a government entity to operate in a particular area, that the legislature contemplated the kind of action complained of.'" 98 S.Ct. at 1138, quoting 532 F.2d at 434.

As discussed above, the imposition of waste flow restrictions is within the authority of the City of Berkeley, and the Act requires that counties impose waste flow restrictions in connection with waste recovery facilities. Therefore, it appears that waste flow restrictions fall within the scope of the state action exemption as expressed in Lafayette, since such waste flow restrictions are explicitly required by state law.

[footnote continued from page 5]

it works closely with Alameda County in developing the project, in order to ensure consistency with the county solid waste management plan. Also, as discussed below, this obligation of the county to assure the availability of waste for resource recovery projects could lead to conflicts between competing centers.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 7

The U. S. District Court for the Northern District of Ohio in Glenwillow Landfill, Inc. v. City of Akron, supra, 14 E.R.C. 1013 (N.D. Ohio, December 14, 1979), came to the same conclusion when faced by waste flow restrictions imposed by the City of Akron under Ohio state law. The Ohio law did not go as far as the California Solid Waste Management Act, since it did not explicitly require waste flow restrictions, but simply authorized the creation of solid waste recovery facilities. Therefore, in California, it is clearer that waste flow restrictions would come within the state action exemption to the antitrust laws.

In the Akron case, the ordinance of the City of Akron requiring that waste be disposed of at a central resource recovery center also survived constitutional challenge on a number of grounds. Since the restrictive ordinance being considered by the City of Berkeley would appear to be similar to that imposed by the City of Akron, it would appear that the constitutional analysis would be similar as well. A brief outline of this analysis follows.

Plaintiffs in Akron first argued that the city ordinance impermissibly restricted interstate commerce in violation of Article I, Section 8 of the United States Constitution. The court noted that the ordinance treated waste generated inside the city different from that generated outside the city. However, it found that this distinction did not violate the Commerce Clause for three reasons. First, since the ordinance did not make a distinction based upon whether the waste had crossed state lines, the court noted that any effects on interstate commerce were indirect and incidental. Second, the Akron ordinance served a legitimate local purpose. Finally, the purposes of the regulation could not be served by an ordinance having a lesser burden on interstate commerce. The court concluded that the Akron ordinance did not violate the Commerce Clause.

Plaintiffs in Akron also challenged the ordinance as violative of substantive due process. There, the court reviewed whether the city's police power regulation had an appropriate and direct connection to the health, welfare and safety of city residents. The court concluded that such a relationship indeed existed, even though a number of private

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 8

parties, such as the operator of the facility and the underwriting team, would benefit from the project.

The Akron ordinance also survived a challenge that it would result in a taking of private property without compensation in violation of the Fifth Amendment. Here, the court relied upon California Reduction Co. v. Sanitary Reduction Works, 199 U.S. 306 (1905), concluding that provisions to assure proper disposal of waste are not an unconstitutional taking even though the waste might have some element of value. The court held that reasonable restrictions for health, safety and welfare purposes are within the police power and therefore are not a compensable taking.

The Attorney General of the State of California has come to the same conclusion in Opinion No. SO73/74 IL, dated February 13, 1974. That opinion concluded that solid waste is subject to police power regulation, and such regulation does not constitute a taking violative of the Fifth Amendment. In Opinion No. SO76/6 II, (October 8, 1976), the Attorney General further concluded that such regulation would not constitute an impairment of contract in the event that private waste haulers had city contracts relating to waste collection, so long as the regulation constituted a reasonable exercise of the police power serving the public health and safety, and did not primarily benefit private interests.

3. Potential conflict with the county solid waste management plan

The draft risk analysis indicates that there are a number of other resource recovery centers currently under consideration in the vicinity of Berkeley. As mentioned above, the California Solid Waste Management Act requires that the county resource recovery plans dedicate sufficient waste flow to resource recovery facilities to ensure their financial viability. This provision raises the question of potential conflict between competing resource recovery centers for waste stream commitments. We are currently having a copy of the county solid waste management plan sent to us by the Association of Bay Area Governments. Review of this document and discussion with County Solid Waste

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 9

Management officials will be required in order to determine whether this issue presents a problem for the Project.

(B) IF (A) CAN BE ACCOMPLISHED, INDICATE AND/OR ATTACH A COPY OF THE SPECIFIC REGULATION(S). IF FLOW CONTROL HAS TO BE LEGISLATED, WHAT IS PROBABILITY OF SUCCESS, I.E. PASSING INTO LAW.

The Solid Waste Management Act sections requiring that county plans ensure adequate waste flow to resource recovery centers are contained in California Government Code Sections 66780.8 and 66786, as quoted above at page 5. If a franchise mechanism is used to impose waste flow control, the Berkeley City Charter, at Section 75, requires that such franchises be granted by ordinance. Also any modifications to the business license program would need to be by ordinance. We cannot speculate as to the likelihood of passage of such ordinances. However, other aspects of the Project will require approval by the City Council.

(C) WHAT FLEXIBILITY EXISTS IN THE EXISTING HAULER BUSINESS LICENSE PROGRAM TO MANDATE DROPSITE LOCATIONS FOR ANY MATERIALS PICKED UP DURING THE PERFORMANCE OF THEIR SERVICES?

Waste flow restrictions would probably be implemented through a franchise program or special ordinance, rather than through the business license program. Berkeley has recognized its franchise power in Sections 74-80 of the Charter of the City of Berkeley. The City Council is empowered to grant a franchise by ordinance to:

any person, firm or corporation, whether operating under an existing franchise or not, to furnish the City and its inhabitants with transportation, communication, terminal facilities, water, light, heat, power, refrigeration, storage or any other public utility or service, or to use the public streets, ways, alleys, and places, as the same may now or hereafter exist, in connection therewith.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 10

Charter of the City of Berkeley, Section 75. Solid waste disposal is not explicitly listed within the categories of activities subject to the franchise power of the City Council, but would likely fall within the scope of "any other public utility or service." ^{4/} Thus, a mechanism for imposing waste flow restrictions through a franchise system already exists. Michael Baumann with the City of Berkeley reports that one of the non-profit recycling operations in Berkeley is currently operating under franchise. Other than this one operation, the City of Berkeley does not currently franchise waste haulers.

Waste haulers are required to obtain a business license. However, the business license program is primarily a revenue measure, constituting a vehicle for imposing a gross receipts tax. Business licenses do not specify how businesses are to operate, and are usually granted without controversy, although the City reviews the business to determine whether it is suitable for its location or otherwise in the best interests of the City. The business license program is guided by City Ordinance No. 5017. Our review of this ordinance did not identify any conflicts with a waste flow restriction plan.

(D) PRESENT AN OUTLINE OF THE KEY ISSUES IN THE GENERIC PG&E CONTRACT. THE DOCUMENT NEEDS DELINEATION WITH A STRATEGY OUTLINED FOR ADDRESSING AREAS NOT FELT IN-LINE WITH F.E.R.C. AND/OR LATEST P.U.R.P.A. RULINGS. THE DISCUSSION SHOULD INCLUDE RECOMMENDATIONS ON PRICING STRUCTURES, QUARTERLY ADJUSTMENTS AND POSSIBLE CHALLENGE TO P.U.C.

4/ The question of whether the City may change existing contracts with private organizations for the collection and disposal of solid waste is somewhat more complex. Attorney General Opinion No. SO76/6, dated October 8, 1976, concludes that a city may impose reasonable restrictions upon solid waste disposal, even if those restrictions conflict, in part, with an existing contract between a city and a private party.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 11

The analysis of the potential shortcomings of the PG&E Power Sales Agreement (PSA) primarily centers around whether the PSA incorporates the requirements of the Public Utilities Commission (PUC) decision in OII-26 and the Federal Energy Regulatory Commission (FERC) regulations under Section 210 of the Public Utility Regulatory Policies Act (PURPA), 18 C.F.R. §292, 45 Fed. Reg. 12214, 17959 (February 25, March 20, 1980). In the following respects, it is possible that the terms contained in the PSA fall short of these requirements:

1. By basing energy prices on the prior quarter's price of oil, the price paid would appear to be less than current marginal costs as required by the PUC & FERC actions.

2. The PSA allows the seller to fix "capacity" prices for the term of the contract, but allows "energy" payments to "float" with the price of fuel. If the marginal cost of new capacity increases substantially over the period of the contract, this fixed-price approach could be disadvantageous.

3. As described below in connection with Question (G), the penalties for failure to deliver energy or capacity appear to go beyond that allowed or required by the PUC and FERC rulings.

4. The provisions of the PSA regarding curtailment of power purchases appear to go beyond those contemplated by the PUC and FERC.

5. The interconnection costs to be borne by the seller under the PSA go beyond those permitted by the FERC regulations.

6. For additional reasons, the energy and capacity payments in the PSA may fall short of PG&E's marginal costs.

DISCUSSION: On December 19, 1979, the PUC issued its interim order in OII-26, an investigation into utility purchase of cogenerated power. The decision generally "authorized" PG&E to purchase power from co-generation and

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 12

certain other alternate energy sources. OII-26 at Page 43, Item 3. It found that PG&E's efforts in this direction had been inadequate, and imposed a \$7.2 million penalty on the utility for its delay. Although initially instituted to investigate power purchases from co-generation sources, OII-26 was expanded to include power generated from municipal waste and certain other alternate energy sources. Thus, under the terms of the decision, projects such as the proposed Berkeley Resource Recovery Project are clearly encompassed within the scope of the decision. 5/

OII-26 authorizes PG&E to purchase co-generated power at a rate equaling its marginal cost of electricity. It also requires that utilities supply backup power to co-generators at standard tariff rates. The decision required PG&E to submit data concerning its marginal costs to the PUC within 45 days of the date of the decision; the PSA is PG&E's response. The prices contained in the PSA have been initially approved by PUC staff as reflecting PG&E's marginal cost of electricity.

The federal government has also acted to encourage the use of co-generation and other alternative energy production techniques through Section 210 of PURPA. On February 25, 1980, FERC adopted final regulations implementing §210 of PURPA. 45 Fed. Reg. 12214. The regulations require electric utilities to purchase electric power from, and sell electric power to, qualifying co-generation and small power production facilities. The regulations fairly closely track the PUC decision in OII-26. However, there are some important differences.

Among the most important differences is the fact that the regulations establish the marginal cost of elec-

5/ The PUC decision uses the term "co-gereration" to refer to these other sources as well -- a convention that will be followed in this memorandum. See OII-26 at Page 2. As discussed below, however, the different definitions of co-generation applied in different contexts must be clearly distinguished.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 13

tricity as a maximum price to be paid for cogenerated power. This limitation is contained in §210 of PURPA. The PUC decision did not so limit prices, and appeared to leave open the question of greater than marginal cost pricing. By so limiting the price to be paid for cogenerated power, the FERC regulations limit the degree to which the PUC can later offer increased incentives.

The FERC regulations require that utilities purchase cogenerated power at their avoided cost. This is somewhat different than the PUC decision, which merely authorized such purchase. However, given that the PUC imposed a penalty upon PG&E for failure to institute a cogenerated power purchase program, the permissive nature of the order could be somewhat illusory. In any event, the FERC regulations clarify that utilities must purchase cogenerated power at marginal cost rates.

OII-26 provides for the division of electricity payments into "energy" payments and "capacity" payments. OII-26 at Page 18. The energy factor represents the marginal cost of the utility's fuel. The capacity payments reflect the cost of the powerplants and other hardware. Both PURPA Section 210 and the FERC regulations adopt this approach.

The OII-26 decision is fairly flexible as to how capacity payments are to be set. Capacity payments can vary according to the time of delivery of the power (whether it occurs in peak demand periods or not) as well as to the "firmness" of the power (the certainty with which the power will be provided to PG&E). OII-26 at Page 19. The reliability of the energy is to be compared to that of PG&E's own equipment. Id.

The interim order in OII-26 is simply that, and OII-26 remains open. Thus, later changes are possible, 6/

6/ For example, the decision leaves open the question of "wheeling" power to a second utility in order to provide the seller with a better price. To elaborate, it might be that a

[footnote continued on page 14]

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 14

and the PSA is subject to further PUC review in order to determine whether it is responsive to the decision. Under Section 121 of PURPA, the City probably can intervene in the OII-26 proceeding. PURPA also provides for judicial and/or FERC review of State proceedings.

OII-26 and the FERC regulations let parties contract away any rights that they might gain under those actions. Therefore, it would be wise to build some flexibility into the contract to allow the Project to take advantage of any future increased incentives for co-generated power. 7/ This could be done through negotiation or through intervention in OII-26.

Given this background, each of the potential shortcomings of the PSA listed above will now be discussed.

1. Energy prices may be based, according to the OII-26 decision, on the prior quarter's price of oil. OII-26 at page 18. The PSA introduces a time lag into this analysis, applying a given quarter's oil prices to a time period one or two months after the following quarter. PSA at Appendix B-1. With the current inflation rate in world oil prices, this would appear to factor in a substantial discount rate. It would appear that a more refined analysis would apply some inflation factor (possibly based upon the prior year's inflation rate) to the period between that used for

[footnote continued from page 13]

neighboring utility to which PG&E is connected may have a higher marginal cost than PG&E. In such a situation, the seller would probably prefer that PG&E "wheel" (deliver on its power lines) to that second utility, so that the seller could get the higher rate. This might be one area where further regulatory changes will improve the seller's position.

7/ Note that the seller's right to terminate the contract effectively gives the Project some flexibility so long as capacity payments are not contracted for.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 15

setting the energy price and the period to which that price is applied. Such an approach might be required under the FERC regulations, on the theory that any other price would not reflect PG&E's marginal cost.

2. The energy payments under the PSA vary over time according to the utility's changing marginal costs of energy. At the current time, it is our understanding that these energy payments are based upon oil prices. However, as other forms of energy replace oil, it could be anticipated that the energy payments might decrease, since some other sources (such as nuclear, coal and solar) might have lower energy costs. On the other hand, under the PSA, capacity costs are fixed for the life of the contract, and therefore do not reflect the fact that the utility may be switching to more capital-intensive technologies in the future. Thus, although the PSA might offer attractive capacity payments over the short term, those prices might become substantially less attractive over time. If it is anticipated that marginal capacity costs will increase substantially over time, it might be desirable to have the capacity payments subject to periodic readjustment, such as the PSA does with energy payments.

One way to accomplish the same result under the existing contract might be to simply commit to capacity payments for shorter periods of time, renegotiating the price at the end of each period. However, the price schedules would have to be reviewed to determine whether this would actually be a more attractive approach. As mentioned above, the FERC regulations provide that capacity payments must reflect the utility's avoided cost of new capacity. Thus, it might be possible to argue that the fixed capacity payments violate the FERC requirement that prices be set at marginal cost, since those fixed payments could fall well below future marginal capacity costs.

The FERC regulations suggest that the capacity and energy costs may be "linked." 45 Fed. Reg. 12216. Thus, if the energy payments are based upon the marginal cost of oil, the capacity payments may be based upon oil-fired capacity. This would support PG&E's current basing of capacity prices

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 16

on the avoided cost of oil-fired capacity. However, it also supports the position that future capacity payments be based upon the then-existing marginal cost of capacity, if the energy payments decrease as a result of a capital intensive oil substitution approach through which the utilities switch from oil to other fuel types.

3. The FERC regulations require that "legally enforceable obligations" to deliver energy must be provided in order for capacity payments to be permitted. 45 Fed. Reg. 12216. Thus, some of the limitations in the PSA setting forth penalties in the event of failure to provide capacity may be required by the FERC regulations. However, it appears that the PSA may go beyond these requirements.

The PSA provides that the seller must pay for alternate sources of energy in the event of failure to provide power, even in the absence of an agreement to provide firm capacity. PSA at Appendix A-5. Not only is this provision contrary to the PUC decision which requires different treatment of "firm" and "non-firm" power, but it also does not specify the rate that the seller would need to pay if it failed to provide electricity. See OII-26 at Pages 23-24.

One of the most restrictive aspects of the PSA is the penalty provision in the event of outages when a seller contracts for capacity payments. PSA, Appendix D. The penalties for unexpected outages are harsh. The seller must pay PG&E an amount equal to the difference between the capacity price at the time of termination and that originally contracted for, as that difference would apply to the entire remaining term of the contract. If capacity prices had increased substantially since the original contract, that amount could approach or exceed the amount that the project had received from PG&E, resulting in a net payment to PG&E even though substantial amounts of power had been delivered. Although the FERC regulations require that firm commitments be entered into before capacity payments are permissible, the requirements and penalties in the PSA appear to go beyond what FERC was contemplating.

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 17

4. The FERC regulations address the issue of curtailment of power purchases during periods when the utility is able to obtain marginal power from sources other than oil-fired plants. 45 Fed. Reg. 12227. During periods when the utility is utilizing only baseload ^{8/} power plants (such as coal or nuclear) which have relatively inflexible power outputs, the regulations suggest that it would be preferable to curtail purchase from the cogenerated power sources rather than engaging in the difficult and expensive process of varying the power output of its baseload plants. The FERC regulations require that prior notice be given of such purchase curtailments, and provide that the utility must pay for power wrongly curtailed (i.e., if it later turns out that the utility was not obtaining marginal power from its baseload plants). These notice and payment provisions are absent from the PSA.

The PSA section providing for power purchase curtailment has additional problems. PSA at Appendix A-8. First, curtailment does not appear to be limited to those time periods when the utility is producing marginal power from a baseload facility. The way that the section is currently drafted, at any time when PG&E is generating any power (not just marginal power) from either hydroelectric, nuclear or other unspecified (non-oil) facilities, it need not purchase from the co-generation source. This condition is probably met most of the time. Therefore, PG&E could avoid purchase of power up to the total limit of 600 hours per year specified in this section of the PSA.

5. The FERC regulations also address the question of inter-connection costs. The regulations limit these costs to: (1) those in excess of what the utility would otherwise pay if it were generating the power itself, and (2) those facilities which the utility must provide in addition to those required to sell power to the co-generation source.

^{8/} Baseload power plants are steady-state operations used to provide the bulk of the utility's power. They are distinguished from peaking units which can vary output quickly.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 18

18 C.F.R. §292.101(b)(7), 45 Fed. Reg. 12230. In addition, the regulations suggest that the inter-connection costs be amortized, and not paid up-front by the seller. Further, the inter-connection costs must be reasonable. Id. The PSA, in contrast, takes a fairly expansive approach to inter-connection costs that must be borne by the seller. The PSA provision for special facilities to be financed by the seller is drafted very broadly, and could be read to require the seller to pay for relatively unrelated improvements to the PG&E system. PSA at Appendix A-3, A-4. Under the PSA, the seller must pay for Special Facilities or other Interconnection Facilities necessary for PG&E "to reinforce its system" or which are "necessary additions" to the system. The PSA provides for specific negotiation of these terms in Appendix G, and such negotiation should take place with the FERC guidelines in mind.

6. There are additional reasons that the PSA might fall short of the PUC and FERC requirements, particularly in terms of the price schedule that it contains. First, the FERC regulations set some standards for capacity prices that may not be reflected in the PSA schedules. Payments must reflect the aggregate effect of all co-generation sources on the construction requirements of the utility. Thus, if enough co-generation occurs to enable PG&E to avoid construction of a large baseload coal or nuclear facility, the capacity payments should reflect the resulting savings to the utility. Likewise, if purchase of cogenerated power permits the utility to postpone a large capital expenditure, this factor should be included in the capacity payments as well.

The regulations require all utilities, by November 1, 1980, to estimate the future avoided costs of capacity additions. 45 Fed. Reg. 12218. Also, utilities are to disclose their scheduled capacity additions for the next ten years at that time. Thus, by the end of the year, the City will be in a better position to assess whether PG&E's capacity prices in the PSA truly reflect PG&E's marginal cost of new capacity during at least some portion of the anticipated life of the contract. It would be wise either to wait until this information is available before actually entering into the contract, or at least to leave the contract open for

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 19

subsequent modification to reflect any more favorable prices which appear later. The actual price schedules in the PSA are primarily a technical rather than legal issue. The California Energy Commission and/or PUC might be willing to assist in analyzing specific numbers proposed by PG&E.

(E) PLEASE IDENTIFY ANY SPECIFIC AREAS OF ADDITIONAL CONTRACTUAL NEGOTIATIONS NOT YET DEFINED IN THE DRAFT DOCUMENT, E.G., TIE-IN LINES TO GRID?

In addition to the areas where the PSA appears to fall short of the requirement of the PUC and FERC rulings, the following aspects of the contract are left open for further negotiation, and should be clarified in the contract adopted by the City:

1. Under OII-26, PG&E is to help the seller with the environmental permitting process. OII-26 at page 44, Item 12. The PSA does not address such legal assistance.

2. As discussed above, the PSA does not automatically provide for increases in capacity payments in the event that the marginal cost of the utility's capacity increases.

3. As mentioned under Item 5, Question (D), the PSA form does not specify the special facility and interconnection costs to be borne by the seller.

4. The PSA allows the seller to define its obligations so flexibly as to lack "consideration" as a matter of contract law. In order to avoid this problem, the project should either commit some portion of the supply from the facility to PG&E, commit to capacity payments, or recast the PSA as an option contract.

5. The penalty for failure to provide power is left open, and if this provision is left in the PSA, it should be more clearly defined.

(F) WHAT ABOUT SELLING STEAM VS. ELECTRICITY
SHOULD WE BE SOLICITING AN ESTIMATED RATE SCHEDULE FOR PG&E PURCHASE ALIGNED TO THE POWER PRICE ADJUSTMENTS NOW PUBLISHED?

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 20

The question of whether the Project should sell steam rather than, or in addition to, electricity is primarily one of economics and technology. However, certain legal considerations might influence such a decision. First, a facility producing only steam might lose the favorable terms applicable to the sale of electricity and might lose exemption from regulation as a public utility. Second, a facility producing only electricity might not come within certain definitions of co-generation, particularly for purposes of exemption from regulation under the California Public Utilities Code. However, since a facility producing only electricity could still be a small power production facility under PURPA, Section 210, it could be exempt from certain State and Federal regulations as such, and could also be eligible for marginal cost sales under the FERC regulations. A facility producing only electricity would also come within the OII-26 definition of co-generation, and therefore be eligible for the benefits of that decision.

One of the primary incentives created by the FERC regulations and OII-26 decision is the requirement that electric utilities are to purchase power from co-generation and small power production facilities at favorable rates reflecting the utility's marginal costs. By their terms, however, the FERC regulations do not apply to the sale of steam. For example, the term "purchase" in the FERC regulations is defined as "the purchase of electric energy or capacity or both from a qualifying facility by an electric utility." 18 C.F.R. §292.101(b) (2) (emph. as added). Similarly, the OII-26 order only appears to cover sales of electricity. Thus, PG&E might not be required to buy steam at marginal cost rates. 9/

9/ Note that the most recent PURPA regulations expressly reserve the question of whether a waste-fired boiler which provides steam to a utility for the production of electricity constitutes a "qualifying facility." Thus, the regulations implicitly recognize that such steam sales might be eligible for the PURPA incentives within the limited situation where steam is sold to the utility for the generation of electricity by that utility. 45 Fed. Reg. 17963.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 21

Certain "qualifying facilities" are exempt from certain state and federal regulation under 18 C.F.R. §§292.601 and 292.602. 10/ Under 18 C.F.R. §292.101, quali-

10/

§292.601. EXEMPTION TO QUALIFYING FACILITIES FROM THE FEDERAL POWER ACT

(a) Applicability. This section applies to:

(1) qualifying cogeneration facilities; and

(2) qualifying small power production facilities which have a power production capacity which does not exceed 30 megawatts.

(b) General rule. Any qualifying facility described in paragraph (a) shall be exempt from all sections of the Federal Power Act, except:

(1) Sections 1-30;

(2) Sections 202(c), 210, 211, and 212;

(3) Sections 305(c); and

(4) Any necessary enforcement provision of Part III with regard to the sections listed in paragraphs (b) (1), (2) and (3) of this section.

§292.602. EXEMPTION TO QUALIFYING FACILITIES FROM THE PUBLIC UTILITY HOLDING COMPANY ACT AND CERTAIN STATE LAW AND REGULATION

* * *

(b) Exemption from the Public Utility Holding Company Act of 1935. A qualifying facility described in

[footnote continued on page 22]

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 22

fying facilities are defined as co-generation facilities or small power production facilities. 18 C.F.R. §292.202(c) defines co-generation facility as "equipment used to produce electric energy and forms of useful thermal energy (such as heat or steam) used for industrial, commercial, heating, or cooling purposes, through the sequential use of energy." (emphasis added). Section 201 of PURPA, 16 U.C.S. §796, defines small power production facility as a facility which "produces electric energy solely by the use, as a primary

[footnote continued from page 21]

paragraph (a) shall not be considered to be an "electric utility company" as defined in section 2(a)(3) of the Public Utility Holding Company Act of 1935, 15 U.S.C. 79b(a)(3).

(c) Exemption from certain State law and regulation.

(1) Any qualifying facility shall be exempted (except as provided in paragraph (c)(2)) of this section from State law or regulation respecting:

(i) The rates of electric utilities; and

(ii) The financial and organizational regulation of electric utilities.

(2) A qualifying facility may not be exempted from State law and regulation implementing [Section 210 of PURPA].

(3) Upon request of a State regulatory authority or nonregulated electric utility, the Commission may consider a limitation on the exemptions specified in subparagraph (1).

(4) Upon request of any person, the Commission may determine whether a qualifying facility is exempt from a particular State law or regulation.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 23

energy source, of biomass, waste, renewable resources, or any combination thereof..." (emphasis added). Thus, the exemption from regulation only applies if electricity is produced. Moreover, any exemption, if applicable, is only an exemption from regulation as an electric utility. No exemption from regulation as a steam or heat utility is provided by PURPA.

California law provides a similar exemption from PUC regulation as an electric corporation for those facilities employing co-generation technology. Co-generation technology is defined in the California Public Utilities Code as "the use for the generation of electricity of exhaust steam, waste steam, heat, or resultant energy from an industrial, commercial, or manufacturing plant or process, or the use of exhaust steam, waste steam, or heat from a thermal powerplant for an industrial, commercial, or manufacturing plant or process.... Co-generation technology shall not include steam or heat developed solely for electrical power generation." California Public Utilities Code Section 218.5. 11/ However, as with the exemption under PURPA, the exemption is from regulation as an electric utility. Note that this section requires that steam or heat be produced in

11/ The OII-26 order adopted an expanded definition of co-generation, including generation from biomass, refuse derived fuels and wood wastes (which may or may not include co-generation). OII-26 at page 2. In addition, the PURPA regulations apply to small power production facilities, thus bringing many of the facilities covered by the expanded definition adopted by OII-26 within the range of PURPA regulation.

Under both the federal and state definitions of co-generation technology, the Project would not be considered a co-generation project unless the production of steam and electricity were sequential. That is, the same steam would need to be used for electricity production as is used for processed functions, rather than some steam being utilized for power production and some for use as steam.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 24

order for the co-generation exemption from regulation as an electric corporation applies. However, the PURPA exemption, which applies to small power production facilities as well as co-generation facilities, effectively preempts this problem.

California Public Utilities Code Section 224, which subjects "heat corporations" to regulation as public utilities, does not contain a similar exemption for facilities utilizing co-generation technology. Thus, a facility which produces only steam might be subject to regulation. The issue of the regulation of steam is presented more fully below under question (H).

(G) ANY COMMENTS PERTAINING TO THE RELATIVE 'ENFORCEABILITY' OF PENALTY CLAUSES FOR NOT MEETING CAPACITY GENERATION RATES IN THE PG&E CONTRACT?

This is a question of considerable scope which came new to us, and the short time given us to respond has precluded extensive research. Based on limited research, the penalty clauses contained in the PSA are not clearly unenforceable. Therefore, we believe the City should deal with those clauses in contract negotiations, rather than hope that a court would consider the clauses so unreasonable as to constitute unenforceable penalties, rather than valid, liquidated damages. Also, as discussed above, the penalty clause appears to go beyond that permitted by the PURPA regulations, and may thus be modified by PG&E. Given the likelihood of further changes in the PSA before and during final negotiations by the City, we do not think it is useful for us to devote any further research to this issue at this time.

(H) IS STEAM A REGULATED COMMODITY - HOW CAN IT BE SOLD (BID, NEGOTIATED, ETC.) AND HOW MANY MARKETS MUST EXIST IF THAT DETERMINES REGULATORY STATUS?

This is also a new question upon which we have performed only limited research. Our initial conclusion is that the steam from the facility would be a regulated commodity so long as the facility is privately owned or operated, and the steam is offered for sale to the public generally, even though only one or a few purchasers are

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 25

actually found. The practical effect of such regulation would need to be explored more fully if steam sales are contemplated.

Steam can be a regulated commodity in California so long as (1) the facility is not owned by a municipality, and (2) it is produced by property "dedicated to public use." If the steam were regulated in this case, that regulation would cover the price, quality of service and other issues. Chapter 3 of the California Public Utilities Code ("PUCode"), Section 451 et seq., details the rights and obligations of public utilities, generally outlining the scope of the regulatory authority of the California Public Utilities Commission.

Public utilities are defined in PUCode Section 216 to include, inter alia, electrical corporations and heat corporations. Heat corporations include "every corporation or person owning, controlling, operating, or managing any heating plant for compensation within this State, except where heat is generated on or distributed by the producer through private property alone solely for his own use or the use of his tenants and not for sale to others." PUCode Section 224.

The definition of corporation includes "a corporation, a company, an association, and a joint stock association." PUCode Section 204. The definition of person includes "an individual, a firm, and a copartnership." PUCode Section 205. Municipalities are not included within these definitions, and thus are not subject to PUC regulation, even though they engage in the sale to the general public of heat or electricity.

If the facility were privately owned, and the exemptions discussed above under Item (F) do not apply, the production of steam would be subject to regulation if the steam were delivered to the public or any portion thereof. PUCode Section 216. "The public or any portion thereof" is defined in PUCode Section 207 as "the public generally, or any limited portion of the public, including a person, private corporation, municipality, or other political sub-

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 26

division of the State, for which the service is performed or to which the commodity is delivered." It does not matter that one or a few customers actually receive service, the question remains whether the service is offered to the public generally. Richfield Oil Corp. v. Public Utilities Commission, 54 C.2d 419 (1960). Thus, the mere fact that only a single purchaser of the steam is found does not necessarily limit the Project's exposure to regulation as a public utility, if such regulation would otherwise apply. In such a situation, it would be possible to seek an opinion letter from the PUC concerning whether the facility would be subject to regulation.

(I) WHAT SPECIFIC HELP CAN BE EXPECTED FROM THE STATE P.U.C. IN DISCUSSIONS/NEGOTIATIONS WITH PG&E (UNDER OII-26)?

On a formal level, the California Public Utilities Commission is required to implement the FERC regulations under Section 210(f) of PURPA. PURPA Section 210(g) provides that the state's implementation of PURPA regulations is judicially reviewable. Moreover, FERC can review the implementing actions of the PUC, providing an additional means of leverage on the state agency. Finally, the OII-26 proceedings remain open, and therefore offer at least one formal avenue for the City of Berkeley to influence the terms of the PSA.

It is also possible that informal PUC assistance might be available. Current indications are that the PUC staff is inclined to accept the PSA as responsive to the OII-26 decision. This does not necessarily mean that the staff would not respond to claims that the PSA falls short of the requirements of the FERC regulations. However, any conclusions concerning PUC assistance obviously remain speculative. It should be noted that the Special Projects Office in the Development Division of the California Energy Resources Conservation and Development Commission is charged with encouraging new energy sources, and might therefore be of assistance.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 27

(J) CAN YOU CONFIRM THAT THE FACILITY CAN BUY POWER AT A LOWER PRICED INDUSTRIAL RATE WHILE SELLING IT TO PG&E AT A HIGHER INCREMENTAL COST? MIGHT THIS BE CHALLENGED IN COURTS?

Both OII-26 and the FERC regulations require that the utility purchase power at its incremental cost, while at the same time providing electrical service to the customer at standard tariff schedules. Section 210 of PURPA does not explicitly establish marginal cost as the price for power purchases. However, it does suggest that standard tariff rates are to set the price for power sales to co-generation facilities, by stating that such sales prices "shall not discriminate against the qualifying co-generators or qualifying small power producers." Section 210(c)(2).

Power purchases are to be at rates which are "just and reasonable to the electric consumers of the electric utility and in the public interest, and [do] not discriminate against qualifying co-generators or qualifying small power producers." Section 210(b). It is possible that a challenge to the marginal cost pricing approach in the OII-26 decision and/or FERC regulations will occur. Such a challenge might be based upon the claim that marginal cost pricing is not just and reasonable to other utility purchasers. Any conclusions as to the likelihood of such a challenge, or the possibility of its success, remain speculative.

(K) IS IT BETTER FOR PUBLIC OR PRIVATE OWNERSHIP OF THE ENERGY PRODUCTS AND/OR MATERIALS BASED ON F.E.R.C. OR P.U.C. REGULATIONS?

The OII-26 decision and PURPA regulations apply to most purchases of power, regardless of whether the facility is publicly or privately owned. If more than 50% of the project were to be owned by PG&E, however, the facility would lose its status as a qualifying facility 12/ under the FERC

12/ Note that qualifying facilities are to notify FERC of that fact, and must meet certain standards. 18 C.F.R. §§292.203 - 292.207.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Mr. Robert H. Brickner
Gordian Associates Incorporated
April 21, 1980
Page 28

regulations, and thus lose its ability to obtain marginal cost rates and regulatory exemption. 18 C.F.R. §§292.203, 292.206. Also, as discussed above under Item (H), public ownership of the facility would reduce the likelihood of regulation as a public utility.

The contents of this letter are for use by you, Brown, Vence & Associates, and the City of Berkeley in connection with studies for the Project. No other use or dissemination of this letter may be made (except to your counsel, LeBoeuf, Lamb, Leiby & MacRae, but subject to the same limitations) without our prior consent. Please feel free to call or write me if you have any questions about the materials in this letter.

Sincerely,



Alan Waltner

cc: ✓ Michael Brown
RPF

APPENDIX E

**STEAM MARKET SURVEY MATERIALS
AND LETTERS OF INTEREST**



750 GILMAN STREET / BERKELEY, CALIFORNIA 94710 / (415) 525-1188

June 17, 1980

Brown, Vence & Associates
124 Spear Street
San Francisco, CA 94120

Attention: Thomas Reilly

Dear Mr. Reilly:

This is in reply to your letter of May 28, 1980 regarding the Berkeley Solid Waste Recovery Project.

Cal/Ink is considering alternatives to our present steam generation plant. Among the alternatives is the purchase of steam from the Berkeley Solid Waste Management Center. If the price of this steam is within the economic framework of our other alternatives, then Cal/Ink would be interested.

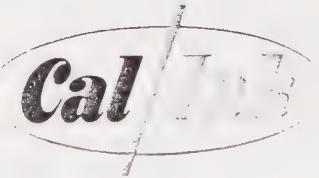
If you need further information, please contact me.

Sincerely,

CAL/INK

Michael W. Ferguson
Michael W. Ferguson
Plant Manager

MWF/mb



750 GILMAN STREET / BERKELEY, CALIFORNIA 94710 / (415) 525-1188

June 20, 1980

Brown, Vence & Associates
124 Spear Street
San Francisco, CA 94120

Attention: Mr. Thomas Reilly

Dear Mr. Reilly:

This is further to my letter of June 17, 1980.

As I mentioned in our telephone conversation, Cal/Ink is planning to do an engineering study of our present steam generation plant. When we have the results of this study and have evaluated the engineering firm's recommendations, we will be in a better position to determine if the purchase of steam from the City of ~~Berkeley~~ is economically attractive to us. At this point, I think we are several months away from having this information.

Sincerely,

CAL/INK

Michael W. Ferguson

Michael W. Ferguson
Plant Manager

MWF/mb

This is

NAME OF ORGANIZATION:

Parent _____

LOCATION:

Branch Plant _____

TYPE OF ACTIVITY:

PERSON(S) RESPONDING TO QUESTIONNAIRE:

Division of _____

Subsidiary of _____

How long in business in this area?

How long operating at this location?

	Current	Compared to 1 year ago	Compared to 5 years ago			
TOTAL EMPLOYMENT	_____	_____	_____	Start of 1st Shift	End of 1st Shift	
OPERATIONAL DATA:	Shifts/day	Days/week	_____	_____ a.m.	_____ p.m.	a.m.
			Vacations		Holidays	

SCHEDULED CLOSINGS: _____

Have any new facilities been added during last 5 years? _____ Yes _____ No

Are there any current plans for expansion or modernization of

Physical Plant?

Production Capacity?

FUTURE PROSPECTS

- a. What are the prospects for continued operation of this plant over the next 10-20 years?
- b. What might be the relative expected scale of operations compared to today?
- 1) Energy Consumption:

	<u>Next 10 Yrs.</u>			<u>Next 20 Yrs.</u>		
	Up	Same	Down	Up	Same	Down
	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %

IF CITY WISHED TO MAKE PROPOSAL FOR SALE OF RECOVERED ENERGY, WHO SHOULD THEY INITIALLY CONTACT?

Name _____ Title _____

Telephone No. _____

Name _____ Title _____

Telephone No. _____

Name _____ Title _____

Telephone No. _____

WHAT TYPE(S) OF FUEL(S) IS CURRENTLY USED?

INTEREST IN UTILIZING RECOVERED ENERGY

STEAM

If steam were provided on a reliable basis at the quality required:

a. How much steam would plant be willing to purchase?

1) on an hourly basis _____ lbs.

maximum _____ lbs.

minimum _____ lbs.

2) on a monthly basis _____ lbs.

3) annually _____ lbs.

b. Characteristics of steam desired

1) Temperature _____ °F

2) Pressure _____ psig

c. Would the company be willing to use its boilers as stand-by
boilers only? yes no

d. Would the company be willing to enter into a long-term, 10
to 20 years, contract for the purchase of steam? yes no

e. How should the price of steam be established?

f. Where would be the best location for a steam line hook-up?

g. What information would the company need in order for it to
sign a letter of intent to purchase?

APPENDIX F

**SECONDARY MATERIAL
MARKETS CONSULTANT REPORT
AND SURVEY MATERIALS**

SECURING MARKETS FOR FERROUS METAL, ALUMINUM AND CORRUGATED BOXES
FOR BERKELEY'S PROPOSED RESOURCE RECOVERY FACILITY

Prepared By

Terry D. Harrison
Manufacturing Engineer
Healdsburg, California

For

Brown, Vence and Associates
San Francisco, California

April 1980

1 INTRODUCTION

In the Phase One Study, the potential markets for mechanically separated ferrous metal and aluminum and source separated corrugated boxes were surveyed along with the markets for several source separated materials. An excellent market for all three materials was found and current price levels, rough specifications and terms of sale were determined. The purpose of this study is to develop specifications and terms of sale for Berkeley's materials, update the 1977 study, and obtain letters of intent from those firms who had expressed willingness to purchase material from Berkeley in the earlier study.

It is assumed that recovered materials will be sold by the city of Berkeley rather than a private operator. The bid process for a municipality is proscribed by law and generally requires that all responsible and responsive bidders have an opportunity to bid for the recovered material. Many firms are not willing to make firm

commitments in today's economic climate for materials which will not be available for two years or longer. Therefore it was not practical to solicit firm prices at this time. In order to obtain the most accurate possible, potential buyers were asked to indicate their intention to bid in two years on a firm contract, their current price and the floor price for a five year contract, and the price for a five year contract. The revenue from material sales is projected based on the price levels determined from the letters received from potential buyers (and interviews conducted with them) and projected material quantities based on analyses of municipal refuse conducted as part of this study, quantities of recyclable materials determined in Phases One and Two of the proposed separation techniques.

2 METHODOLOGY

The specifications for ferrous and aluminum fractions were projected by the consultant and Brown, Vence and Associates' engineers based on specifications for materials recovered from similar systems elsewhere and specifications cited by buyers in the Phase One Study. The specification of the Paper Stock Institute of America for Corrugated Containers was adopted for that material. (Paper Stock Standards and Practices, Paper Stock Institute of America). Table 1 lists the specifications and terms of sale.

The survey conducted in 1977 indicated that many of those responding would be willing to bid on a long term contract of up to five years and would be willing to bid FOB Berkeley (freight at the

expense of the buyer). These terms were adopted as giving the best comparison of prices and the longest obtainable contract term. The quantity of materials was based on the Phase Two Study and work to date on Phase Three.

A letter from Roy E. Oakes, Director of Public Works, City of Berkeley was sent in early February, 1980, to all those firms who had indicated interest in any of the three materials in the 1977 survey along with specifications, a background sheet and a form entitled "Indication of Intention to Bid for Resource Materials". Potential buyers were asked for the following information on this form: current prices, the floor price that they would bid on a five year contract if bidding today, and the market index they would like used for determining the price on a five year contract when the price was higher than the floor price. Copies of the letters and forms sent to buyers are at the end of this report.

When less than half those to whom a mailing was sent responded within three weeks, all those who had not responded were contacted by phone. In some cases several phone conversations or personal interviews were required in order to obtain sufficient responses.

3 RESULTS

Fourteen letters were sent out originally. Eleven written responses were received: either letters or on the form provided. Two other firms indicated a willingness to bid when Berkeley was ready to actually market material. A common complaint was that

many similar requests from other studies had been made recently and that the number of marketing studies greatly exceeded the number of new sources to come on line!

In the following sections, each of the three materials will be treated separately. The current study confirmed the results of the earlier one indicating that a good market still exists for each of the materials. Current market conditions are discussed, but the extensive background material dealing with the markets for each material that were presented in the Phase One Study are generally still valid and are not repeated here. (Appendix B, Phase One, Solid Waste Management Center, City of Berkeley, Garretson, Elmendorf, Zinov and Reibin, June 1978). As might be expected in an economy experiencing high inflation and shrinking supplies of resource materials, the price levels are higher now for all three materials than in the Fall of 1977.

3.1 FERROUS METAL

The responses from potential buyers of ferrous scrap metal are summarized in Table 2. The market for ferrous scrap is weaker than the market for the other two materials because of lessening domestic demand. Copper mines in Nevada which formerly used de-tinned tin cans for precipitation of copper have closed. The domestic steel industry has suffered because of foreign competition. These factors are counter-balanced by a strong export demand.

3.1.1 Mechanically Separated Light Metal

This material would be separated from the municipal refuse from the fraction which passes through a trommel screen. It would contain a high percentage of steel food cans many of which would be tin plated.

The responses summarized in Table 2 show a wide range of prices quoted. One reason appears to be a rapid market drop during the course of the survey so that later responses indicated a lower price than earlier ones. Although Judson Steel indicated a much higher floor price, this was by phone and a written response was not received. Steel cans collected by Community Conservation Centers in Berkeley are currently sold to Judson Steel for \$30 per ton; recent prices have ranged from \$20 to \$50 per ton. Schnitzer Steel originally indicated a floor price also of \$90 per ton but when questioned they indicated that a lower figure of \$30 to \$40 per ton would be more realistic. The level of \$30 per ton is indicated as a reasonable price for projecting revenue.

A problem common to ferrous and aluminum scrap is determining the specifications of the material which Berkeley will generate. Judson Steel indicated tin, lead and aluminum are particularly troublesome contaminants which are present in tin cans. The volume of material projected from Berkeley is so small (less than 1% of their needs) that they would be willing to use it even if these materials were present. The price they would be willing to pay might vary if the contamination level were high. They offered the

services of their laboratory to make trial melts when samples are available in order to pin down the suitability of Berkeley's ferrous scrap for their manufacture of reinforcing bar. They stated that the main reason they would be willing to use Berkeley's material would be as a "good neighbor" rather than a need for this type of scrap.

3.1.2 Other Ferrous Scrap

Other forms of ferrous metals are available from Berkeley's waste other than steel cans. Currently Urban Ore who operate the recycling at the landfill are marketing Number 2 Baling, Number 2 Heavy Metal Scrap and Cast grades. Heavy Metal Scrap, such items as structural steel and reinforcing bar and cast material such as engine blocks and sinks would best be placed into debris boxes and not mixed with refuse but some could be pulled out of the mixed refuse. Urban Ore are receiving approximately \$81 per ton and \$90 per ton respectively for the Number 2 HMS and Cast grades.

Number 2 Baling consists of sheet, other light ferrous materials, and "white metal", appliances such as hot water heaters and dish washers made of enameled sheet steel. Large pieces could be kept separate from the mixes refuse of pulled out. Two strategies present themselves for marketing this grade. It could either be marketed with the cans or separately. If the cans are sold to MRI for de-tinning, the cans would be sold separately as MRI is interested in reclaiming as much tin as possible and the light metal would dilute the tin concentration. If the cans are sold to a

mill such as Judson the addition of the light metal to the cans would reduce the contamination level of can components such as lead, tin and aluminum. Some light gage steel will be pulled out of the refuse by magnetic separation anyway. The future of the de-tinning industry is somewhat in question because the level of tin used in cans is steadily dropping due to a rapid rise in the cost of tin and a very limited world supply mostly controlled by underdeveloped nations. Although MRI did indicate willingness to bid for Berkeley's cans, they did not send a formal reply.

Steel cans used for copper precipitation should not be mixed with galvanized steel sheet as zinc is an unacceptable contaminant for that industry.

The best long range marketing strategy appears to be to mix the cans with other light gage ferrous metals resulting in a more marketable total fraction at the expense of a potential reduction in the price of the light metal without cans.

3.1.3 Incinerated Ferrous Metal

The alternative of removing ferrous scrap from the residue following an energy recovery system, rather than before the organic fraction was oxidized, was examined from the marketing stand point. Three of the firms interested in ferrous metal from Berkeley, Judson Steel, Schnitzer Steel and MRI were asked if they would have interest in ferrous metal pulled from the residue magnetically. All three indicated they did not think they would be interested. Their

main concern is the large amount of inorganic contaminants that might be entrained in the iron: both metals such as aluminum and non-metallic material such as glass. Presumably ferrous metal recovered after energy recovery would contain little organic contamination. Larry Dunham of Judson Steel stated this is little advantage in their operation as the organics are oxidized in their furnace anyway.

From a marketing point of view, removal of ferrous metal prior to energy recovery is the best strategy. If other considerations suggest it should be pursued further, tight specifications or samples from existing facilities could be presented to Judson, MRI, Schnitzer and others for their further consideration.

3.2 ALUMINUM

The market for aluminum scrap is strong and can be expected to remain so. The principle world deposits of bauxite (aluminum ore) are controlled by underdeveloped countries who may be tempted to emulate OPEC's example. The energy saving associated with the use of scrap is ninety percent of the energy required to produce aluminum from bauxite in older refining facilities. Exporters are currently quoting higher prices than domestic producers.

3.2.1 Aluminum Cans

Five written responses were received. One additional firm indicated by phone that they would bid on a firm contract. The recycling of aluminum cans is now a well established industry

practice and the major aluminum producers have their own specifications and terms of sale. Two responses were made on the basis of the specifications projected for Berkeley. Three firms cited their own or ASTM specifications, which include the maximum amount of other metals that are permissible. These specifications are summarized in Table 5. They include a density range specification ranging from 14 to 25 pounds per cubic foot. This can be achieved only by shredding or baling. Some Northern California community recycling centers are shredding aluminum cans with shredders which cost in the same area as the cost of the corrugated box baler planned for Berkeley. While a shredder does take up some space, this should be counter-balanced by the decreased space required to store cans for shipment.

The can producers prefer shipment by rail.

Rail transport will probably become an increasingly important method because of the energy savings over truck transport. Two responses were made based on picking up cans at Berkeley. Only Schnitzer's included a floor price. Although the current market price quoted by Fiber Cycle is much higher, as were the prices from Kaiser and Alcoa, in the absence of confirming floor prices, prudence dictates using Schnitzer's floor price of \$425 per ton for economic projections.

3.2.2 Other Forms of Aluminum

The high value of aluminum suggests that other forms present in the solid waste stream should be recovered. Currently several grades are being recovered at the Berkeley landfill. Discussions were held with Bay Cities Resource Recovery, Kaiser Aluminum and Levin Metals, Richmond in order to access this market.

A common form of aluminum is extrusions such as window frames and lawn furniture. This metal contains lower percentages of other metals and is therefore more valuable. It can be added to the cans and could raise the price received for them or sold separately. Urban Ore are currently receiving a price of \$.48/lb or \$960/ton delivered to Oakland or Richmond for unclean aluminum extrusions. Other grades of aluminum found in refuse and delivered scrap dealer prices as of March 10, 1980 are:

Cast Aluminum.....	\$860/Ton
Old Sheet.....	\$860/Ton
Light Aluminum.....	\$500/Ton
Aluminum Clippings.....	\$1020/Ton
Clean Extrusions.....	\$1220/Ton
Mixed Aluminum.....	\$ 880/Ton

Aluminum contaminated with other metals sells as mixed metal at \$.38/lb. This grade permits inclusion of steel fasteners for instance, and is approximately the current price if an aluminum fraction for all the aluminum other than cans was collected together. These prices are scrap metal dealer prices. A truck-load or carload of aluminum extrusions can be sold directly to an

aluminum extruder who melts ingots and scrap prior to extrusion. Two California aluminum extruders buying scrap extrusions are reported to be Ametek Aluminum, Los Angeles and S - G Metals, Inc., Gardena, California. Urban Ore has been offered debris box transportation for \$14 per ton less than the price FOB Berkeley.

3.3 CORRUGATED BOXES

The market for corrugated boxes has remained strong for some time. Generally the cyclical market for waste paper follows the economic cycle with prices dropping at the beginning of a downturn in the economy and rebounding sharply after inventory reductions have taken place and the demand for paper products starts to increase. A particular and unusual factor in todays market is a reduction in the availability of wood chips and sawdust, which are raw materials for virgin pulp and are by-products of the lumber industry, because of a downturn in construction. The rest of the economy has resisted efforts to slow it with the result that demand for paper products is still strong. This has created a pulp shortage and increased demand for waste paper.

The bay area is fortunate to have the only 100% recycling box liner board mill in the country, Crown Zellerbach's mill at Antioch. A tour of this mill was made by the consultant in February, 1980. Over 600 tons per day of old corrugated boxes are consumed there. Berkeley's projected tonnage is around 1% of that volume, a neglegible factor in the local market. There is

also a strong export market for old corrugated boxes at this time.

3.3.1 Letters of Intent

Four written responses were received for corrugated boxes. The results are tabulated in Table 4. The current market price ranged from \$50 to \$70 per ton and the minimum floor price from \$40 to \$50 per ton. Two responses indicated a floor price of \$50 per ton; this figure will be used for projecting potential revenue.

3.3.2 Specifications

Specifications cited in the letter requesting letters of intent for corrugated boxes is the Corrugated Containers specification of The Paper Stock Institute of America (Paper Stock Standards and Practices). A maximum of 1% of prohibitive materials such as plastic bags and other gross contaminants is allowed and a maximum of 5% outthrows. Outthrows are other forms of paper not suitable for manufacture of box board such as magazines and newspapers. Careful supervision will have to be excised if boxes are pulled from a belt or tipping floor at the resource recovery facility but this specification can be met. Waxed and water resistant produce boxes will present the greatest difficulty to recognize and avoid. Design of the recycling depot includes a paper baler for waste corrugated. This should be capable of producing a 60 inch or 72 inch long bale approaching 1,000 pounds as the paper mills prefer a large dense bale and some will not accept smaller bales such as are produced at smaller supermarkets. Loose corrugated boxes pulled out of refuse on the tipping floor could be

transported to the recycling center for baling and sale with corrugated collected at the recycling center. An alternative would be to market the corrugated boxes loose. This may require transportation by the seller to a paper stock dealers warehouse. The price received is less for loose boxes than for bales; the differential being about \$14 per ton. (Average differential from Table B-13, Phase One Study)

4.0 REVENUE

The revenue projected using the prices derived in the previous sections is summarized in Table 6. The prices determined in Phase One are included for comparison. The floor prices now are higher than the market prices in 1977 for all three materials. This is easily accounted for by inflation and increasing world competition for resource materials. It would be rash to attempt to project this rate of increase over the two year period which may elapse before a resource recovery facility is constructed. Further increases are highly likely, however. This could in part be off-set by a decrease in the quantities of material that will result if prices increase markedly because that will encourage Berkeley residents and industries to collect and market their own materials particularly those households with lower incomes. This trend is evident in the increasing recovery of aluminum cans at buy-back centers. If Berkeley has a buy-back center either as part of the recycling complex proposed for Second and Gilman Streets or elsewhere, the effect will be a shift in the method of collection, not the overall quantity.

Future shortages of materials may cause shifts in material usage which will impact the quantities and prices projected here. An example is beverage cans. There has been a partial shift back to bi-metallic cans by some bottlers because of the rising cost of aluminum.

Table 1

MATERIALS TO BE RECOVERED FROM BERKELEY'S RESOURCE RECOVERY PLANT

Material	Projected Quantity	Form	% Major Component	Contaminants	
				Organic	Inorganic
Mechanically Separated Light Ferrous Metals	1,000 - 1,500 tons/year	loose	90%	5%	5%
Aluminum Cans	100 - 200 tons/year	loose	98%	less than 2%	1%
Corrugated Boxes	1,500 - 2,000 tons/year	baled		total 1% organic and inorganic; outthrows not to exceed 5%	

PROJECTED TERMS AND CONDITIONS FOR MATERIALS CONTRACTS WITH CITY OF BERKELEY

1. The term of the contract will be five years at either a fixed price or at a price tied to a commodity index such as the "Official Board Market" with a minimum (floor) price.
2. Prices to be FOB the resource recovery facility in Berkeley. If a substantially higher price could be offered delivered to a buyer, indicate that price in addition to the FOB Berkeley price.
3. The proposed contract would be written for the range of quantities shown above; the buyer committing to take all of a particular material.

Table 2

FIRMS INTENDING TO BID FOR MECHANICALLY SEPARATED LIGHT FERROUS METALS
 (FOB Berkeley, February/March 1980)

Firm	Current Price	Floor Price	Market Index	Comments
		5 Year Contract	5 Year Contract	
	\$/Ton	\$/Ton	\$/Ton	
Judson Steel Corp. Emeryville, CA	90	90	#2 Bundle Price	Phone quotation (see sec. 3.1)
MRI Corp. So. San Francisco, CA	25	10	#2 Bundle Price SF Market	Phone quotation
Markovitz and Fox San Jose, CA				Will bid on contract no current price info given
Proler International Houston, Texas	30% to 50% of #1 HMS* price (approx. \$35/T to \$55/T)			Letter with approx. current price. Will bid on contract
Schnitzer Steel Products Oakland, CA	90	30-40	#2 HMS* for S.F. American Metal Market	

*HMS is Heavy Melting Scrap

Table 3

FIRMS INTENDING TO BID FOR RECOVERED ALUMINUM CANS
(FOB Berkeley, February/March, 1980)

Firm	Current Price 5 Year Contract \$/Ton	Floor Price 5 Year Contract \$/Ton	Market Index 5 Year Contract	Baling or Shredding Required	Comments
Aluminum Company of America Pittsburgh, PA			Own Formula	Yes	Requested reply confidential. Should meet their specification. Price within range of others.
Fiber Cycle, Inc. Redwood City, CA	860			No	Would provide a containment system.
Kaiser Aluminum & Chemical Oakland, CA	900-960			Yes	Price for ASTM Grades 1 & 2. Would have difficulty meeting that specification.
Markovitz and Fox San Jose, CA					Will bid on contract. No prices given.
Reynolds Aluminum Richmond, Virginia			Closing prices, Yes Smelter Scrap Al, Amer. Metals Mkt.		No Current prices given. Would have difficulty meeting their specification.
Schnitzer Steel Products Oakland, CA	425	425	American Metals Mkt.	No	

note: See Table 5, Aluminum Can Specifications, for Aluminum producers specifications.

Table 4

FIRMS INTENDING TO BID FOR RECOVERED CORRUGATED BOXES
(FOB Berkeley, February/March 1980)

Firm	Current Price	Floor Price	Market Index	Comments
	5 Year Contract \$/Ton	5 Year Contract \$/Ton	5 Year Contract	
Crown Zellerbach Corp. Antioch, CA	55	50	S.F. High, Official Board Market, Old Cor., plus \$10/Ton	Offered \$8/Ton freight allowance if delivered to Antioch, CA
Consolidated Fibers Richmond, CA	50	40	Same as above except plus \$20/Ton	
Fiber Cycle, Inc. Redwood City, CA	65			Minimum Pick-up of 20 Tons
Bay City Paper San Leandro, CA		50	Official Board Market	

Above prices are for baled corrugated boxes. The Phase One Study indicated approximately \$14 less per ton would be received for loose corrugated boxes, (Table B-13)

Table 5
SCRAP ALUMINUM SPECIFICATIONS
Composition, Maximum % Allowable

Contaminant	ASTM Grade 1	ASTM Grade 2	Reynolds Grade B
Silicon	.3	.3	.5
Iron	.6	.7	1.0
Copper	.25	.4	1.0
Manganese	1.25	1.5	1.25
Magnesium	2.0	2.0	2.0
Chromium	.05	.10	.3
Nickel	.04	.04	.3
Zinc	.25	.25	1.0
Lead	.02	.04	.3
Tin	.02	.04	.3
Bismuth	.02	.02	.3
Titanium	.05	.05	.05
Others (Each)	.04	.05	.05
Others (Total)	.12	.15	.15
Aluminum	Balance	Balance	
Fines through 12 mesh screen			3.0

Kaiser referred to the ASTM specifications. Alcoa provided their own confidential specification, which are similar to ASTM Grade 1. Fiber Cycle and Schnitzer Steel quoted on the basis of the specifications in Table 1.

The following density specifications were cited: Reynolds, 15-25 Lbs/Ft³; Alcoa, 14 - 17 Lbs/Ft³; Kaiser, 16 - 22 Lbs/Ft³

Kaiser, Alcoa and Reynolds specified rail shipment.

Table 6

PROJECTED REVENUE FROM FERROUS METAL, ALUMINUM AND CORRUGATED BOXES
(FOB Berkeley, February/March 1980)

Material	1977 Market Price ¹	1980 Floor Price	Projected Quantity	Revenue
Light Ferrous Metal	\$32/Ton	\$30/Ton	1,000-1,500 Tons/year	\$30,000-45,000/yr.
Aluminum Cans	\$333/Ton	\$425/Ton	100-200 Tons/year	\$42,500-85,000/yr.
Corrugated Boxes baled	\$43/Ton	\$50/Ton	1,500-2,000 Tons/year	\$75,000-100,000/yr.
loose	\$29/Ton	\$361 Top ²	1,500-2,000 Tons/year	\$54,000-72,000/yr.
Total (loose corrugated)			2,600-3,700 Tons/year	\$126,500-202,000/yr.

¹Table B-2, Solid Waste Management Center, Phase One, Garretson, Elmendorf, Zinov and Reibin, 1978²Based on \$14 per ton less for loose than baled determined in the Phase One Study, (Table B-13)

Table 7

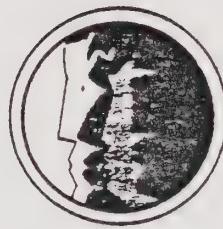
FIRMS INTENDING TO BID FOR METALS

Firm/Plant Location	Materials of Interest	Mailing Address	Contact/Phone Number
Alcoa	Aluminum Cans	Alcoa Building Pittsburgh, PA 15219	Wm F. Hill/412-553-4645
Judson Steel Corp./Emeryville	Ferrous Cans & Scrap	500 Sansome St.	Larry D. Dunham/415-362-5944
Fiber Cycle/Redwood City	Aluminum Cans	3620 Haven Ave. Redwood City, CA 94063	Ronald V. Hunt/415-367-9090
Kaiser Aluminum & Chemical Corp.	Aluminum Cans	300 Lakeside Dr. Oakland, CA 94643	A. E. Hoffmeister/415-271-3936
Markovitz and Fox/San Jose	Aluminum and Ferrous Cans and Scrap	Box 1868 San Jose, CA 95109	M. R. Fox/408-295-3663
M R I Corp.	Tin Cans	5121 San Fernando Rd. W. Los Angeles, CA 90039	John Mitchell/213-240-7265
Reynolds Metals Co.	Aluminum Cans	Richmond, VA 23261	G. F. Bourcier/
Schnitzer Steel Products/ Oakland	Aluminum and Ferrous Cans and Scrap	Foot of Adeline St. Oakland, CA 94607	Stue Blackman, Gary Schnitzer 415-444-3919
Proler International Corp./ Verson, CA	Ferrous Scrap & Cans	P.O. Box 286 Houston, Texas	Ralph D. Dodd/910-881-3667

Table 8
FIRMS INTENDING TO BID FOR CORRUGATED BOXES

Firm/Plant Location	Mailing Address	Contact/Phone Number
Bay City Paper/Oakland	2615 Davis St. San Leandro, CA	Pete Lunardini/415-638-4322
Consolidated Fibers/Richmond	5327 Jacuzzi St. Richmond, CA	Jerome Lucey/415-527-8500
Crown Zellerbach Corp./Antioch	1 Bush St. San Francisco, CA 94104	D. S. Platt/415-823-5806
Fiber Cycle/Redwood City	3620 Haven Ave. Redwood City, CA 94063	Ronald V. Hunt/415-367-9090

CITY OF BERKELEY



DEPARTMENT OF PUBLIC WORKS
2180 MILVIA STREET, 5TH FLOOR

BERKELEY, CALIFORNIA

(415) 644-6523
94704

INDICATION OF INTENTION TO BID FOR RECOVERED PRODUCTS

In the fall of 1977, your firm replied to a market survey conducted by Garretson-Elmendorf-Zinov-Reibin (G.E.Z.R) for the City of Berkeley indicating interest in purchasing ferrous metal, aluminum, or corrugated boxes recovered from Berkeley's waste or separated at the source. Studies over the past two years have indicated it may be feasible to recover materials and energy from a resource recovery facility in Berkeley and, as part of the third phase of the overall study, Berkeley has contracted with G.E.Z.R to develop economic projections for the amount of revenue that could be received through the sale of ferrous metals, aluminum, and cardboard. The project is summarized on the attached sheet.

It is anticipated that, should Berkeley proceed with a resource recovery facility, materials would be offered through the standard municipal bidding procedure. Requests for bids are probably at least two years away but it is vital to update the market information received from you and others in order to complete the feasibility and economic studies. Please fill in the enclosed questionnaire indicating how you would respond to a request to bid on a five-year contract if one were requested at this time.

This request covers ferrous metal (which would be magnetically removed from the waste stream) and aluminum cans and cardboard or corrugated boxes (which would be hand sorted) but does not include source separated materials which are now collected by several firms and non-profit groups in Berkeley. The proposed plant would supplement these efforts.

The attached table summarizes quantities and specifications as currently developed. Should your firm require specifications differing from these, or if you have other questions, please contact G.E.Z.R's marketing consultant, Terry D. Harrison, 4395 Westside Road, Healdsburg, CA 95448; telephone: 707/433-6420. Please send the completed form to him in the enclosed self-addressed envelope. Your indication of a good market two years ago was instrumental in our reaching this stage in our planning. Please help us create a new steady source of supply for your industry.

Very truly yours,

Roy E. Oakes
Director of Public Works

1/15/80

MATERIALS TO BE RECOVERED FROM BERKELEY'S RESOURCE RECOVERY PLANT

Material	Projected Quantity	Form	% Major Component	Contaminants	
				Organic	Inorganic
Ferrous Metal Scrap	1,000 - 1,500 tons/year	loose	90%	5%	5%
Aluminum	100 - 200 tons/year	loose	98%	less than 2%	1%
Corrugated Boxes	1,500 - 2,000 tons/year	baled		total 1% organic and inorganic; outthrows not to exceed 5%	

PROJECTED TERMS AND CONDITIONS FOR MATERIALS CONTRACTS WITH CITY OF BERKELEY

1. The term of the contract will be five years at either a fixed price or at a price tied to a commodity index such as the "Official Board Market" with a minimum (floor) price.
2. Prices to be FOB the resource recovery facility in Berkeley. If a substantially higher price could be offered delivered to a buyer, indicate that price in addition to the FOB Berkeley price.
3. The proposed contract would be written for the range of quantities shown above; the buyer committing to take all of a particular material.

INDICATION OF INTENTION TO BID
FOR RESOURCE MATERIALS

RECOGNIZING THE NEED TO DEVELOP CURRENT MARKET INFORMATION IN ORDER TO ESTABLISH THE FEASIBILITY OF RECOVERING FERROUS METAL, ALUMINUM, AND CARDBOARD (CORRUGATED BOXES) FROM THE CITY OF BERKELEY'S WASTE, THE UNDERSIGNED INDICATES:

WE WILL BID FOR: (CHECK ONE OR MORE) FERROUS METAL, ALUMINUM, AND/OR CARDBOARD IF SENT A REQUEST FOR BID IN APPROXIMATELY TWO (2) YEARS, INCLUDING THE TERMS AND CONDITIONS OUTLINED IN THE ACCOMPANYING LETTER.

IF WE WERE RESPONDING TO A BID TODAY, THE PRICE WOULD BE AS FOLLOWS FOR A FIVE-YEAR CONTRACT:

FERROUS METAL @ \$ _____ PER TON FOB BERKELEY
ALUMINUM @ \$ _____ PER TON FOB BERKELEY
CARDBOARD @ \$ _____ PER TON FOB BERKELEY

OR

OUR BID WOULD BE TIED TO A COMMODITY INDEX WITH A MINIMUM FLOOR PRICE FOR FIVE YEARS AS FOLLOWS:

FERROUS METAL @ \$ _____ PER TON FOB BERKELEY FLOOR PRICE -
RELATIONSHIP TO _____ INDEX.
ALUMINUM @ \$ _____ PER TON FOB BERKELEY FLOOR PRICE -
RELATIONSHIP TO _____ INDEX.
CARDBOARD @ \$ _____ PER TON FOB BERKELEY FLOOR PRICE -
RELATIONSHIP TO _____ INDEX.

PLEASE ADD COMMENTS REGARDING SPECIFICATIONS, PREPARATION, AND TRANSPORTATION, ETC. TO REVERSE SIDE.

(Signature)

FIRM _____

(Title)

ADDRESS _____

PHONE _____

(Date)

APPENDIX G

**EFFECTS OF EXPANDED RECYCLING PROGRAMS -
CONSULTANT REPORT**

QUANTITIES OF MAJOR RECYCLABLE MATERIALS IN THE
WASTE STREAM FOLLOWING CURBSIDE COLLECTION AND
OTHER RECYCLING PROGRAMS

Prepared By

Terry D. Harrison
Manufacturing Engineer
Healdsburg, California

For

Garretson, Elmendorf, Zinov and Reibin
San Francisco, California

June , 1980

1 INTRODUCTION

The purpose of this study is to project the impact that planned expansion of recycling programs in Berkeley will have on the waste stream entering the resource recovery facility. Originally defined as determining how the curbside collection program affects the resource recovery facility's waste stream, it was found necessary to recap the quantities of materials recycled by various modes as determined in previous studies and Phases One and Two and project the quantities that will likely be recycled in the future. The broader scope is necessary because of the interlocking nature of recycling programs (the volume collected by one program may impact the volume collected by another) and to include the impact of the planned drop-off and buy-back recycling depot at Second and Gilman Streets. The materials recovered are the major materials which are being recycled through source separation in Berkeley: ferrous and aluminum cans and scrap, glass, newspapers and corrugated boxes. This study is

necessary in order to determine the amount of materials which will be left in the waste stream for recovery or energy conversion at the resource recovery facility after expansion of the recycling programs.

1.1 Present Recycling in Berkeley

Currently there are several modes of recycling through source separation in Berkeley.

Direct Some residents, commercial firms and industrial firms collect and transport recyclable materials directly to metal or paper scrap dealers. Examples are residents who take aluminum cans to a buy-back center and metal casting firms who take their scrap to a dealer.

Commercial and Industrial Recovery Firms Larger generators of recyclable materials are serviced by dealers in those materials who provide a pickup service. Examples are waste paper dealers who pickup bales of corrugated boxes at supermarkets and individuals who pickup scrap metal at garages and small machine shops.

Community Recycling Organizations These include the Ecology Center who have operated a monthly curbside residential newspaper pickup program for seven years and Community Conservation Centers who have operated one or two drop-off recycling centers in Berkeley for five years; predecessor organizations operated centers in Berkeley since 1969. Berkeley Youth Alternatives, who operate a job training program, supply personnel to Community Conservation Services for their center

and also operate a pickup of recyclables for residents and businesses in west Berkeley on an appointment basis. Recovery Recycling operate a subscription monthly pickup of glass, cans and newspapers from homes in Berkeley. The amounts handled are relatively small.

Recycling at the Landfill Since assuming operation of the Berkeley Landfill in 1979, Bay City Paving and Grading through an affiliated organization, Urban Ore, have recycled increasing quantities of ferrous metal including light sheet, white goods and castings and aluminum including extrusions, castings and sheet. They have also recycled corrugated boxes although there is none being recycled there at the present time. In addition, they operate an "as is" used furniture and appliance yard.

1.2 Planned Expansions of Recycling Programs

Expansions are planned by the Ecology Center and Community Conservation Centers. The Ecology Center will expand their present monthly pickup of newspapers to include mixed aluminum and steel cans and glass. Wine bottles will be kept separate and sold to Encore for reuse. The Center has received a grant from the State Solid Waste Management board for equipment which will include three especially designed trucks with bins and a fork lift truck. Following pickup by the two person crews, recyclables will be dumped into debris boxes at a site the Center has leased temporarily in Emeryville before transportation to markets. When space has been prepared at Second and Gilman Streets in Berkeley, the

Center will move there. Coordination with Community Conservation Centers is planned for trucking to markets.

Community Conservation Centers desires to establish a recycling and buy-back depot at the Second and Gilman site in advance of the establishment of a transfer station or resource recovery facility for refuse. The Berkeley City Council has approved funds for paving and fencing an area for that purpose. CCC has applied to the State Solid Waste Management Board for funding for part of the \$359,000 projected capital expenditures; it appears likely that at least partial funding will be obtained. It is unclear whether the present center at the corner of Dwight Way and Grove Street will be operated after the new center has been opened. In addition to the materials now-collected: newspaper, cardboard, glass, and cans, it is proposed that the new center will collect highgrade office paper, mixed waste paper, oil, wine bottles and scrap metal. Patrons of the center can either donate their materials as they do now at the present center or receive a modest price for most of the materials except mixed waste paper. It is this buy-back feature which is anticipated to increase patronage and tonnage of those materials already being collected. Table I details the present and projected volume of major materials.

A third proposal for expanded labor intensive recycling in Berkeley has been developed by Berkeley Environmental Development Corporation, a new non-profit organization associated with Bay City Resource Recovery. They propose to extract high-grade

metals such as copper bearing alloys from appliances and other items and sort ferrous and aluminum in order to upgrade these metals at the Berkeley Landfill. If this proposal were implemented, it would remove some additional ferrous and aluminum scrap from the waste entering the resource recovery system but because the impact would be less and the proposal was not funded by the State Solid Waste Management Board, the impact is not considered in this study.

2 METHODOLOGY

Tables 1 and 2 detail the steps in the analysis. First, the identified quantities of the various materials currently recycled or contained in the waste streams entering the Berkeley Landfill and going to neighboring landfills from Berkeley are listed and totaled. Then, the projected quantities which will be recycled after expansion of the curbside pickup and new drop-off and buy-back center and the quantities projected leaving Berkeley are listed and totaled. The difference, or the amount left over, is the reduction in quantities which will enter the resource recovery facility. The following sources and assumptions were used to outline the structure of the present recycling streams and project changes in those streams.

2.1 Surveys at the Berkeley Landfill made in December, 1979, March, 1980 and June 1980 by Brown, Vence and Associates projected the quantities and composition of the waste coming from municipal collection from residences and commercial establishments. A June 1980 survey measured

the amount of material entering the landfill from other sources and estimated the composition.

2.2 The quantities of materials recycled by commercial sources was taken from Appendix F of the Phase One Study.

2.3 It is assumed that little or no industrial waste is included in refuse collected by municipal packer trucks. The amount of materials from industrial sources could not exceed the percentages of industrial waste projected in Appendix D of the Phase Two Study to be unsuitable for processing at a resource recovery facility. The minimum amount of industrial materials was projected as half the amount found to be going to the Berkeley Landfill in that study.

2.4 It was assumed that industrial recycling of corrugated boxes might increase from the very low level found in the Phase II survey in 1978 to 50%. This is reasonable because of continued high price levels for corrugated and the higher level of recycling practiced by retailers in Berkeley, (over 65%).

2.5 The quantities of materials presently recycled by the Ecology Center, Recovery Recycling, Community Conservation Centers, Urban Ore, Berkeley Youth Alternatives and Recovery Recycling were determined through personal interviews with the three larger groups and

copies of the "Alameda County Recycling Centers Survey" performed in July, 1979 by Rick Codina and Catherine Evans under a grant by the State Solid Waste Management Board.

- 2.6 The amounts of materials projected for the Ecology Centers expanded pickup of recyclables were projected from an interview with the Ecology Center staff, an unpublished study by the consultant done for the Ecology Center in 1978, and "Home Separation of Recyclables in Berkeley", March 1976, prepared by The League of Women Voters of Berkeley. The participation rates used are 15% to 30%. Present participation is 15%.
- 2.7 The amounts of materials projected for the buy-back and drop-off recycling centers planned by Community Conservation Centers at Second and Gilman in Berkeley are based on their SB 650 grant application to the State Solid Waste management Board by Community Conservation Centers entitled "Central Recycling Depot" and a personal interview with Pamela Bellchamber of that organization.
- 2.8 Assumptions based on the past history of recycling in Berkeley and other communities were made regarding the impact of one recycling program upon another. It was assumed that the volume picked up by Recovery Recycling would drop to about a fourth its present volume, that Berkeley Youth Alternative's volume would remain constant.

2.9 A difficult variable to access is the interrelationship of Berkeley's recycling programs with those of neighboring communities and those run by industry. When the first recycling center was initiated on Sacramento and University in Berkeley in 1969, there were no others in the East Bay.

2.10 It is assumed that Berkeley's container Deposit Ordinance will be implemented. In 1973, a survey at the two sites in Berkeley indicated 15 percent of the volume came from outside Berkeley. Presently, there are many other recycling programs competing for Berkeley's recyclable materials; a partial list includes a highly publicized drop-off, buy-back and curbside pickup program in El Cerrito which also picks up in Albany, recycling centers in Oakland, aluminum cans buy-back programs run by can and beverage companies, waste paper dealers operating in Berkeley, Richmond and Oakland, and Encore which buys wine bottles directly from the public in Emeryville. The impact of these programs varies with market conditions, for instance the door price for newspapers paid by waste paper dealers has varied from \$5 to \$40 per ton during the past few years. A high price spawns volunteer collection programs by groups such as the boy scouts and the theft of newspapers destined for the Ecology Center from the curb at night. This results in a very substantial drop in the volume picked up by that program. Kaiser Aluminum plans

an extensive buy-back program for aluminum cans in the East Bay. The range of material quantities used in projecting some programs is partly due to the uncertainty engendered by these factors.

2.11 The tables do not include all types of waste paper recycled in Berkeley. A principal form of waste paper generated in Berkeley is office waste. In the Phase One Study, (Table F-1) it was estimated that 5,000 tons per year of both high and low grade office waste paper was generated by the offices and institutions within the city. It was estimated that 1,200 tons per year were being recycled and 3,800 tons were not.

Community Conservation Centers plans to accept both high-grade office paper and mixed waste paper at the proposed recycling depot. The 72 tons per year of high-grade paper and 25 tons per year of mixed waste paper they project that would be recovered would reduce the available fiber for energy conversion by 97 tons per year.

3 DISCUSSION OF RESULTS

The changes in material streams are detailed in Tables 1 and 2. Some minor material streams which have not been quantified, including newspaper recycled by printers such as the Berkeley Daily Gazette, aluminum cans, glass and newspapers which are recycled at buy-back centers outside of Berkeley and waste paper

stock dealers by individuals and groups such as the boy scouts.

The total maximum reduction in paper tonnage entering the resource recovery facility due to implementation of expanded curbside pickup and the recycling depot are summarized below.

Newspapers	2,640 Tons per year
Corrugated boxes	1,545 Tons per year
High-grade office	72 Tons per year
Mixed waste paper	25 Tons per year
Total reduction in paper	4,282 Tons per year

The potential maximum loss of revenue at the resource recovery facility due to the expanded curbside pickup and recycling depot, based on the current market prices determined in the study on securing markets (appendix) and assuming a recovery level of 65% for aluminum and 85% for ferrous metal, is as follows:

85% of 961 Tons per year ferrous scrap @ \$30/Ton	\$24,500
65% of 72 Tons per year aluminum scrap @ \$425/Ton	\$19,900
Total potential loss of revenue	\$44,400

Removal of glass from the waste stream entering the resource recovery facility reduces the quantity of waste material which must be disposed of following the recovery system and should reduce wear in the system. The additional amount of glass that will be recycled by the expanded curbside pickup and the new recycling depot is projected at a maximum of 2,145 tons per year. It is estimated that 90% of the glass entering the resource

recovery facility will fall through the 2" holes in the trommel screen and 10% pass on through into the combustible fraction. The disposal costs for the fine fraction is projected by Brown, Vence and Associates at \$10.65 per ton and for the residue at \$45-\$110.50 per ton depending on the disposal site. The maximum saving in disposal costs resulting from the increase in recycling is 90% of 2,145 tons per year @ \$10.65/Ton
+ 10% of 2,145 tons per year @ \$45-\$110.50/Ton = \$30,200-\$44,300/
year

The net economic impact of increased ferrous metal, aluminum and glass recycling is seen to be virtually zero as the potential loss in revenue from the facility's sale of ferrous and aluminum, \$44,400 is compensated by the saving in disposal cost of the glass, projected at \$30,200 to \$44,300 per year. The total impact of increased recycling, then, is a reduction in paper entering the facility of a maximum of 4,300 tons per year.

Table 1

QUANTITIES OF MAJOR RECYCLABLE MATERIALS CURRENTLY RECYCLED & LANDFILLED

<u>Presently Identified Material Streams</u>	Tons per Year				
	Ferrous Metals	Aluminum	Glass	Newspapers	Corrugated Boxes
Currently Recycled:					
Ecology Center	-	-	-	960	-
Recovery	4	1	16	2	4
Berkeley Youth Altern.	5	3	73	4	68
Community Cons. Ctr. BCRRD	90 1,100	18 60	1020 -	600 -	72 -
Industrial Recycling	550	5	-	-	140
Commercial Recycling	-	-	110	-	1,700
Total Recycled	1,749	87	1,219	1,566	1,984
Currently Landfilled:					
Berkeley Municipal	1,535	330	4,270	4,150	2,905
Commercial/Private	5,200	150	10,100	3,150	5,250
Commercial to other	-	-	-	-	280
Industrial to other	24	-	80	-	849
TOTAL AVAILABLE	8,508	567	15,589	8,866	11,268

Table 2
PROJECTED QUANTITIES OF MAJOR MATERIALS TO BE RECYCLED & LANDFILLED AFTER EXPANDED RECYCLING

	Tons per Year				
	<u>Ferrous Metals</u>	<u>Aluminum</u>	<u>Glass</u>	<u>Newspapers</u>	<u>Corrugated</u>
Projected Recycling: Container Ordinance	54	20	238	-	-
Ecology Center Recovery	170-320 1	20-30 1	700-1,400 3	1,000-1,900 2	-
Berkeley Youth Altern.	5	3	73	4	68
Community Cons. Ctr. BCRRD (goes to same center)	180 1,600	20 80	1,500 -	2,300 -	660 -
Industrial Recycling Commercial Recycling	550 -	5 -	- -	- -	800 2,000
Total Projected Recycling	2060-2710	129-159	1814-3364	2106-4206	2529-3529
Other Landfills: Commercial Industrial	-	-	-	-	360 600-1,100
TOTAL NOT TO FACILITY, Maximum	2,740	159	3,479	4,206	4,989
TOTAL AVAILABLE	8,508	567	15,589	8,886	11,268
TOTAL TO FACILITY, Minimum	5,768	408	12,110	4,660	6,279
INCREASE IN RECYCLING	311-961	42-72	595-2145	540-2640	545-1545

APPENDIX H

AIR POLLUTION CONSULTANT REPORT

AIR POLLUTION ASPECTS
OF
CITY OF BERKELEY
SOLID WASTE MANAGEMENT CENTER

March 1980

Prepared for
BROWN, VENCE & ASSOCIATES
124 Spear Street, San Francisco, California

Prepared by
R.G. Lunche
15505 Cristalino Street, Hacienda Heights, California

TABLE OF CONTENTS

- I Summary and Conclusions
- II Introduction
- III Projection of Emissions
- IV Applicable Regulatory Standards
- V Obtaining Air Pollution Permits

LIST OF TABLES

- Table III - 1. Summary of Projected Emissions, City of Berkeley Solid Waste Management Center.
- Table IV - 1. Applicable Emission, New Plant Performance and Hazardous Pollutant Standards.
- Table IV - 2. Applicable Permitting, New Source Review and Prevention of Significant Deterioration Standards.

SUMMARY AND CONCLUSIONS

The City of Berkeley is considering a Solid Waste Management Center (SWMC) consisting of four 50 T/D package incinerators, plus one 50 T/D spare package incinerator. The incinerators will operate under controlled air conditions to dispose of municipal solid waste and to generate steam for sale.

Incinerators, of the design being considered for the City of Berkeley, have been installed in the 25 T/D size and operated in North Little Rock, Arkansas. Emission source tests of these incinerators have been conducted and reported by Systems Technology Corporation (SYSTECH) of Xenia, Ohio. These tests were part of a study sponsored and directed by the U.S. Environmental Protection Agency (EPA) and the California State Solid Waste Management Board. Results of the tests made in the preceding study are used in this report to project emissions from the SWMC. These are then evaluated against applicable regulatory standards and permitting requirements of the Bay Area Air Quality Management District (BAAQMD) and EPA.

Conclusions from the emission projections and the evaluation are:

- 1) Particulate matter testing procedures used by SYSTECH are expected to be acceptable to BAAQMD (only dry filter catch is counted by BAAQMD) as are hydrocarbon, carbon monoxide and carbon dioxide testing procedures.
- 2) Sulfur dioxide and nitrogen oxides testing procedures used by SYSTECH probably will be acceptable to BAAQMD because analyzer was calibrated daily by EPA wet chemistry methods.
- 3) Total particulate matter emissions from the SWMC, with baghouse, electroscrubber or precipitator controls are projected to be 61/lbs/day (0.013 gr/dscf at 12% CO₂).

- 4) Organic compound emissions from the SWMC are projected to be 110 lbs/day (2 to 39 ppm).
- 5) Carbon monoxide emissions from the SWMC are projected to be 200 lbs/day.
- 6) Sulfur dioxide emissions from the SWMC are projected to be 156 lbs/day (1 to 40 ppm).
- 7) Nitrogen oxides emissions from the SWMC are projected to be 736 lbs/day (30 to 114 ppm).
- 8) Lead emissions are projected to be 3 lbs/day, with particulate controls.
- 9) Visible emissions are projected to be below 20% opacity with particulate control.
- 10) Baghouse, electrostatic precipitator or electroscrubber are projected to be effective particulate controls.
- 11) Scrubber may be necessary for hydrogen chloride emissions.
- 12) All emissions are projected to be in compliance with applicable emissions, new plant performance or hazardous pollutant standards but baghouse, precipitator or electroscrubber is needed for particulate and lead control.
- 13) Carbon monoxide may trigger new source review and invoke BACT action depending upon determination by BAAQMD.
- 14) Sulfur dioxide will trigger new source review and invoke BACT action.
- 15) Nitrogen oxides will trigger new source review, invoke BACT action and require emission offsets if BAAQMD rules are interpreted literally.

- 16) Proven BACT for SO_2 or NO_x from controlled air incinerators is unidentified by BAAQMD. One could postulate a caustic scrubber to remove both hydrogen chloride and sulfur dioxide as an example of SO_2 BACT. For NO_x , BACT could be recirculation of some flue gas or, the controlled air incinerator itself, an example of staged combustion, could be called BACT.
- 17) A meeting should be requested with the BAAQMD before the project gets too far along to determine whether BAAQMD will demand BACT for CO, SO_2 and NO_x and emission offsets for NO_x , or allow exemptions for innovative technology or a resource recovery project.
- 18) No PSD application will be required but EPA requires a notification.

II. INTRODUCTION

To find a solution to the problem of municipal solid waste disposal in an environmentally sound manner, the City of Berkeley commissioned a study by Garretson · Elmendorf · Zinov · Reibin (G·E·Z·R) of San Francisco. The second phase of the study centered on the feasibility of recovering energy as an adjunct to the system for municipal solid waste disposal. In its report, "Solid Waste Management Center, Phase Two - September 1978", G·E·Z·R recommended to the City of Berkeley that a package incinerator system be developed to dispose of the municipal solid waste and to generate steam for sale.

Prior to implementation of the G·E·Z·R recommendation, a consideration of the air pollution aspects of the package incineration system is desired. For this purpose, Brown, Vence & Associates, a subsidiary of G·E·Z·R has retained R.G. Lunche to project emissions from five 50 T/D incinerators, report on applicable regulatory standards, and report on permitting potential. Brown, Vence & Associates has stated that only four incinerators will operate at any one time, operation will be under controlled air conditions and incinerator design will be patterned after the design of the 25 T/D units at North Little Rock, Arkansas.

A report^{a)} of a study of the North Little Rock incinerators by Systems Technology Corporation (SYSTECH) of Xenia, Ohio has been provided. The study was sponsored and directed by the U.S. Environmental Protection Agency (EPA) and the California State Solid Waste Management Board. The report describes the incinerator design and operation, designates the emission testing procedures used, presents

a) Small Modular Incinerator Systems With Heat Recovery: A Technical, Environmental and Economic Evaluation.

some test data and presents the test results. Emission factors developed from the test results on the basis of averaged emissions per ton of refuse charged are included in the SYSTECH report.

Applicability of these emission factors to the proposed City of Berkeley Solid Waste Management Center (SWMC) will be reviewed with consideration being given to agreement with the Bay Area Air Quality Management District (BAAQMD) testing procedures. After emissions are projected for the SWMC, regulatory standards will be reviewed to determine applicability and, finally, permitting potential will be evaluated.

III. PROJECTED EMISSIONS

Emissions from the SWMC incinerators are projected by use of emission factors developed in the SYSTECH study of similar design incinerators in North Little Rock, Arkansas. These emission factors are based on a series of tests in October 1978. At that time, the North Little Rock incinerators were closer to full capacity operation than on previous tests and final modifications had been made. Refuse compositions varied from test-to-test but the variations are assumed to be compensated for in the averaging of test results. Although Berkeley refuse compositions may be different than those for North Little Rock, no method of correction is known. It is expected that the variations in North Little Rock are broad enough to make results applicable to SWMC for projection purposes.

The emissions will be calculated for one SWMC 50 T/D incinerator and need only be doubled, tripled or quadrupled to obtain emissions for other combinations of operation. Concentrations of emissions in the stack gases are assumed to be the same as those from North Little Rock for each individual unit. Since the emission factors are averaged over several tests, it is possible that some tests can show higher emissions from SWMC incinerators than projected through use of the emission factors. The result of these emission projections is shown in Table III-1 at the end of this section.

The SYSTECH report states that particulate matter (PM) was collected by EPA Method 5, a method which is acceptable to the BAAQMD. In EPA Method 5, collection on the dry filter is at $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$. BAAQMD testing procedures (which were not available to the public at the time of preparing this report) supposedly specify collection on the dry filter at stack conditions. SYSTECH data

indicate that stack gas temperature was 286°F so that slightly more PM would be collected by EPA Method 5 than by the BAAQMD method. Back calculating from SYSTECH data indicates a temperature of 70°F was used for standard conditions, which corresponds to the BAAQMD definition for the temperature at standard conditions.

SYSTECH reports that it measured organic compounds, or hydrocarbons (HC), by periodic gas sampling and gas chromatography over the C₁ to C₆ range. Chromatography also was used to analyze for HC in the C₇ to C₁₂ range. Levels of HC in the C₁ to C₄ range were found just above the detection level. Levels of higher HC were found only sporadically and in some tests were not detected at all. The SYSTECH report alludes to the use of low resolution mass spectrometry, liquid chromatography and infrared analysis of organic elements. Although specific detail and description is lacking and the BAAQMD publication on procedures was not available in the preparation of this report, the use of gas chromatography is expected to be acceptable to the BAAQMD.

SYSTECH used a non dispersive infrared (NDIR) analyzer for measuring carbon dioxide (CO₂) and carbon monoxide (CO) concentrations in the stack gases. This method is expected to be acceptable to the BAAQMD.

SYSTECH measured oxygen (O₂), sulfur dioxide (SO₂) and nitrogen oxides (NO_x) with a tri-gas monitor manufactured by Theta Sensors, Inc. and by EPA wet chemistry methods. The monitor was calibrated daily against standard gases by EPA wet chemistry methods. The BAAQMD will be hesitant to accept the results from a tri-gas monitor but probably will be persuaded to do so by the fact that the monitor was calibrated daily by EPA wet chemistry methods.

SYSTECH measured lead and other metals by spark source mass spectrometry of the particulates collected by the EPA Method 5 sampling train. Results by this method of analysis are expected to be acceptable to the BAAQMD.

Chlorides and fluorides were collected in the EPA Method 5 sampling train and analyzed by wet chemistry methods.

An Orsat analyzer also was used in the tests for measuring O₂, CO₂ and CO, but instrumentation - derived values were used in the development of emission factors.

Opacity measurements of visible emissions were made by a Leeds & Northrup single pass transmissometer calibrated by neutral density filters. This is expected to be acceptable to the BAAQMD although it would probably like to have an accompanying series of observations by a trained observer.

No comments were noted about odor measurements. Hydrogen sulfide (H₂S) was checked by spark source mass spectrometry but was below detection levels.

A. Particulate Matter Emissions

SYSTECH reports an average particulate matter concentration of 0.130 gr/dscf at 12% CO₂ and an emission factor of 3.03 lbs/ton of refuse charged. These results are based on the particulate matter collected on the dry filter only which corresponds to BAAQMD policy. Uncontrolled particulate emissions projected for SWMC are:

$$3.03 \text{ lbs/day} \times 50 \text{ tons/day} - \text{unit} = 152 \text{ lbs/day} - \text{unit}$$

(=303,455 and 606 lbs/day from 2,3 and 4 units)

Obviously, control of particulate emissions is required. Since SYSTECH reports that 95% of the particulates by weight is less than μm size and 50% is less than 0.3 μm , the selection of

controls are limited to baghouses or electrostatic precipitators which can reach control levels of 99% +. A possible third choice is an Electroscrubber offered by Combustion Power Company, Inc. The brochure for the Electroscrubber claims 96% control is attainable on 0.5 μm size particles and presents test results from an installation to support overall control claims. Although information is limited for the new technology employed by the Electroscrubber, it appears technically feasible. An order of control preference would be baghouse, precipitator and Electroscrubber. If the latter is chosen, additional test data from the manufacturer, guarantee of performance on outlet values from the manufacturer, and approval of the BAAMQD should be obtained prior to installation. To be conservative, only 90% collection efficiency will be assumed for the particulate matter control. On this basis controlled particulate emissions projected for SWMC are 10% of the uncontrolled emissions, or:

0.0130 gr/dscf at 12% CO₂
15 lbs/day - unit
(=30,46 and 61 lbs/day for 2,3, and 4 units)

B. Organic Compound Emissions (Hydrocarbons)

SYSTECH reports an average emission factor of 0.55 lbs per ton of refuse charged based on C₁ through C₆ emission rates converted from PPM measurements using an average molecular weight of 36.56. Hydrocarbon concentrations were in the 2 to 40 PPM range. Emission rates for C₇ through C₁₂ were not used because these compounds were detected sporadically and ^{not} detected on some tests. Hydrocarbon emissions projected from SWMC are:

0.55 lbs/ton x 50 tons/day - unit = 28 lbs/day - unit
(=55,83 and 110 lbs/day for 2,3 and 4 units)

C. Carbon Monoxide Emissions

The SYSTECH developed emission factor for carbon monoxide is 1.00 lbs/ton of refuse charged. Carbon monoxide emissions projected for SWMC are:

$$1.00 \text{ lbs/ton} \times 50 \text{ tons/day} - \text{unit} = 50 \text{ lbs/day} - \text{unit}$$

(=100,150 and 200 lbs/day for 2,3 and 4 units)

D. Sulfur Dioxide Emissions

The SYSTECH developed emission factor for sulfur dioxide is 0.78 lbs/ton of refuse charged. Sulfur dioxide concentrations ranged from 1 to 40 PPM. Sulfur dioxide emissions projected for SWMC are:

$$0.78 \text{ lb/ton} \times 50 \text{ tons/day} - \text{unit} = 39 \text{ lbs/day} - \text{unit}$$

(-78,117 and 156 lbs/day for 2,3 and 4 units)

E. Nitrogen Oxides Emissions

The SYSTECH developed emission factor for nitrogen oxides is 3.68 lbs per ton of refuse charged. Nitrogen oxides emissions projected for SWMC are:

$$3.68 \text{ lbs/ton} \times 50 \text{ tons/day} - \text{unit} = 184 \text{ lbs/day} - \text{unit}$$

(=368,552 and 736 lbs/day for 2,3 and 4 units)

F. Lead Emissions

The SYSTECH developed emission factor for lead is 0.14 lb/ton of refuse charged. Lead concentration in the stack gas is 4.49 mg/M³. Uncontrolled lead emissions projected for SWMC are:

$$0.14 \text{ lb/ton} \times 50 \text{ tons/day} - \text{unit} = 7 \text{ lbs/day} - \text{unit}$$

(=14,21 and 28 lbs/day for 2,3 and 4 units)

Since lead is a particulate, it will also be collected by the anticipated particulate control. Assuming that the particulate controls also conservatively control 90% of the lead emissions, controlled lead emissions will be 10% of uncontrolled emissions, or:

0.7 lb/day - unit
(and 1.4, 2.1 and 2.8 lbs/day for 2,3 and 4 units)

G. Hydrogen Chloride Emissions

The SYSTECH report shows chloride concentrations averaging 107 PPM. No emission factor was developed. No calculations are made since no specific emission standard for hydrogen chloride exists. Hydrogen chloride is a corrosive, acidic gas found increasingly in incinerator flue gases with the increase in plastics in refuse containing chlorine compounds. As hydrogen chloride is quite soluble in water and caustic solutions, simple scrubbers are considered suitable controls and should be considered for SWMC following the particulates control device.

H. Preprocessing Emissions

No specific information has been received about preprocessing other than that there is a possibility of processing the charge through a trommel screen. Trommeling the charge will remove dirt and inert materials and reduce the weight of charge for the same steam production. Although quantitative evaluations cannot be made without test data or correlations, some qualitative observations can be offered on the effect of trommeling on the emissions.

- 1) Btu value of charge will increase slightly and the charging rate can be decreased slightly without decreasing steam production.
- 2) Particulate emissions will decrease slightly.
- 3) Emissions of other contaminants are not expected to change.

If the charging rate is not decreased, then the decrease in particulates may be less or even reversed, and other contaminants would be expected to increase.

TABLE III - I
 SUMMARY OF PROJECTED EMISSIONS
 CITY OF BERKELEY SOLID WASTE MANAGEMENT CENTER

CONTAMINANT EMITTED	EMISSIONS IN LBS/DAY FOR REFUSE CHARGING RATE OF:			
	50 T/D (1 Unit)	100 T/D (2 Units)	150 T/D (3 Units)	200 T/D (4 Units)
Particulate Matter a),c)	152	303	455	606
Particulate Matter b),c)	15	30	46	61
Hydrocarbons a)	28	55	83	110
Carbon Monoxide a)	50	100	150	200
Sulfur Dioxide a)	39	78	117	156
Nitrogen Oxides a)	184	368	552	736
Lead a)	7	14	21	28
Lead b)	1	1	2	3

a) Uncontrolled

b) Controlled

c) Particulate Matter concentrations are 0.130 gr/dscf at 12% CO₂ uncontrolled and 0.0130 gr/dscf at 12% CO₂ controlled.

IV. APPLICABLE REGULATORY STANDARDS

The City of Berkeley Solid Waste Management Center will be located in the jurisdiction of the Bay Area Air Quality Management District. It must comply with emission standards, new source review standards, permitting standards, new plant performance and emission requirements, and hazardous pollutant standards of the BAAQMD. In addition, the Solid Waste Management Center is subject to Prevention of Significant Deterioration review for NO_x and SO₂ by the U.S. Environmental Protection Agency (EPA). The BAAQMD new plant performance and emission requirements parallel EPA's new source performance standards and act for them. A copy of the BAAQMD Rules and Regulations, dated January 1, 1980, was reviewed to tabulate the emission, new source review, new plant performance and emission and hazardous pollutant standards applicable to this project in Tables IV - 1 and IV - 2.

TABLE IV - 1
APPLICABLE EMISSION, NEW PLANT PERFORMANCE
AND HAZARDOUS POLLUTANT STANDARDS

CONTAMINANT	RULE	LIMITATION/PROVISION
Visible Emissions	BAAQMD 6-301	Ringelmann #1 or equivalent opacity except for 3 minutes in any 1 hour.
Particulate Matter	BAAQMD 6-310 BAAQMD 10-3-301	0.15 gr/dscf at 12 % CO ₂ 0.08 gr/dscf at 12% CO ₂ for new solid waste incinerator with a charging rate > 49.6 T/D.
Organic Compounds	BAAQMD 8-2-301	300 PPM (total C) for emissions exceeding 15 lbs/day.
Sulfur Dioxide	BAAQMD 9-1-301 BAAQMD 9-1-302	0.05 PPM (24 hrs), 0.50 (1 hr), 0.14 PPM (24 hrs), 0.5 PPM (3 hrs), 0.03 PPM (1 yr) for ground level concentrations. 300 PPM (dry) for stack concentrations
Hydrogen Sulfide	BAAQMD 9-2-301	0.06 PPM (3 min), 0.03 PPM (60 min) for ground level concentration during any 24 hr. period beyond property line.
Nitrogen Oxides	BAAQMD 9-3-303	125 PPM (gas fuel), 225 PPM (liquid fuel) from heat transfer operation with charging rate > 250 MM BTU/hr.
Lead	BAAQMD 11-1-301	14.9 lbs/day from any emission point. 1.0 $\mu\text{g}/\text{M}^3$ (24 hrs) ground level conc (incl. background) 1.0 $\mu\text{g}/\text{M}^3$ (30 days) ground level conc (without background)
Odors	BAAQMD 7-301 BAAQMD 7-302 BAAQMD 7-303	No odor after dilution with volume of odor-free air specified for emission point elevation. No odor beyond property line after dilution with 4 parts of odor-free air. Table gives PPM of (CH ₃) ₂ S, NH ₃ , RSH, phenols, (CH ₃) ₂ N for types of emission points.

TABLE IV - 2

APPLICABLE PERMITTING, NEW SOURCE REVIEW
AND PREVENTION OF SIGNIFICANT DETERIORATION STANDARDS

CONTAMINANT	RULE	LIMITATION/PROVISION
All	BAAQMD 2-1-301 BAAQMD 2-1-302	Authority to construct required. Permit to operate required.
Organic Compounds SO _x , NO _x , PM ^{a)}	BAAQMD 2-2-101 BAAQMD 2-2-301	> 149.9 lbs/day requires a new source review. > 149.9 lbs/day requires BACT.
CO	BAAQMD 2-2-101 BAAQMD 2-2-301	> Amount determined by APCO requires new source review. > Amount determined by APCO requires BACT. ^{b)}
Organic Compounds, SO _x , CO, PM ^{a)}	BAAQMD 2-2-303 ^{c)}	> 246.9 lbs/day requires emission offsets.
NO _x	BAAQMD 2-2-303 ^{c)}	> 542.3 lbs/day requires emission offsets.
SO _x , NO _x	EPA 40 CFR 51.24	> 250 tons/yr for incinerators charging <250 tons/day of refuse requires a PSD review.

a) PM = Particulate matter

b) BACT = best available control technology, determined on a case-by-case basis.

c) Emission offset requirement invocation depends on number of ambient air quality standard violations in preceding years.

V. OBTAINING AIR POLLUTION PERMITS

Although only one application need be submitted to the BAAQMD for the SWMC, it satisfies the permitting requirements for the emission standards, new plant performance, hazardous pollutants and new source reviews. It, therefore, must be complete with respect to all rules of regulation 2 which describes permit requirements.

The BAAQMD is obligated to deny authorities to construct for equipment which will violate emission limitations. A review of test results for the North Little Rock facility and projection to the SWMC suggests the following possibilities with respect to approval or denial:

1. Visible emissions - Opacity at North Little Rock without controls ranged from 12 to 42% and, therefore, there could be a problem at SWMC. However, the opacity is related to the fine particulate emissions which will be controlled at the SWMC and will result in lower opacities.
2. Particulate matter - This type of emission will be controlled sufficiently below BAAQMD requirements by a baghouse, electrostatic precipitator or electro-scrubber to offer no problem.
3. Organic compounds - Hydrocarbon concentrations at North Little Rock ranged from 20 to 40 PPM, well below BAAQMD requirements and offer no problem.
4. Sulfur dioxide - The concentration of SO₂ at North Little Rock ranged from 1 to 40 PPM, well below BAAQMD requirements. Ground level concentrations at these

low stack concentrations are not expected to offer any problem, but monitoring and/or modeling may be required to demonstrate that compliance.

5. Hydrogen sulfide - H₂S, was not detected in North Little Rock test results so no problem is expected.
6. Nitrogen oxides - No problem is expected for NO_x unless the BAAQMD defines the SWMC as a "heat transfer operation". In that case, the operation would still be below the 250 MM Btu/hr cut off point. Use of a fossil fuel to substitute for lack of solid waste in order to meet steam production commitments would cause definition of project as "heat transfer operation".
7. Lead - No problem is expected with meeting BAAQMD emission standard as long as particulate control is at least 90% effective. The ground level concentration standards are expected to be met but monitoring and/or modeling may be required to demonstrate that compliance.
8. Odors - No problem is expected with odors beyond the property line.

The above review of possibilities indicates that, considering only emission, new plant performance and hazardous pollutant standards, an authority to construct is probable for SWMC.

The BAAQMD also is obligated to undertake a new source review if specified emission levels of organic compounds, particulate matter, nitrogen oxides, or sulfur dioxide are exceeded or if the emission level prescribed for carbon monoxide by the APCO for this specific application is exceeded. Further, BACT and emission offsets may be required in order to obtain an authority

to construct if specified or prescribed levels of the above contaminants are exceeded. A review of the North Little Rock test results and a projection of these to the SWMC suggests the following possibilites:

1. Organic compounds - Hydrocarbon emissions are below the level at which a new source review will be triggered and do not invoke BACT or emission offset requirements.
2. Particulate matter - With at least 90% effective control, particulate emission levels will not trigger new source review, invoke BACT or invoke emission offsets.
3. Nitrogen oxides - Levels of nitrogen oxides will trigger a new source review for the SWMC, will invoke BACT and will invoke emission offset requirements depending upon violations of ambient air quality standards in preceeding years.
4. Sulfur dioxide - Levels of sulfur dioxide will trigger new source review, will invoke BACT, but will not invoke emission offset requirements.
5. Carbon monoxide - Levels of carbon monoxide that trigger new source review or invoke BACT are prescribed by the APCO on a case-to-case basis so no conclusion can be drawn as to the effect of the projected CO levels. The level of carbon monoxide is too low to invoke emission offset requirements.

The above review of the possibilities indicates that a new source review will be required, that BACT can be invoked for NO_x, SO₂, and possibly CO, and that emission offsets can be invoked for NO_x. A BACT requirement for SO₂ may be avoided if analysis

^{refuse}
of Berkeley, for sulfur content shows that the sulfur levels are lower than for North Little Rock. A material balance calculation can then be made to indicate that sulfur dioxide levels are below BACT requirements.

The BAAQMD determines BACT on a case-by-case basis. There is no identification of BACT for SO_2 or NO_x from controlled air incinerators or of proven control technology. One possibility for SO_2 is the use of a scrubber following the particulate control device. A scrubber using a caustic solution can not only reduce the SO_2 emissions but also the hydrogen chloride emissions. For NO_x , it can be argued that a controlled air incinerator itself represents BACT in the form of staged combustion. Additionally, partial recirculation of the flue gases could constitute BACT for NO_x .

If the BAAQMD determines a BACT for SO_2 or NO_x which is infeasible for SWMC, it may be an advantage to SWMC to request an exemption on the basis either that:

- 1) new or innovative technology will be used in accordance with BAAQMD Rule 2-2-112, or
- 2) SWMC qualifies as a resource recovery project on the BAAQMD Rule 2-2-113.

Emission offsets will be required for NO_x if ambient air quality standards for ozone or NO_2 have been exceeded anywhere in the BAAQMD more than three times or an annual standard more than once during the three years immediately preceding the date when the complete application is filed. The BAAQMD is judged an attainment area for NO_x which would signify that NO_2 air quality standards are not being exceeded, but this would have to

be reviewed with the BAAQMD. Air quality standards for ozone have been exceeded in the BAAQMD but these, too, would have to be reviewed with the BAAQMD for the three years immediately preceding the date when a complete application is filed.

An exemption from offsets for a resource recovery project using municipal wastes (2-2-306) is possible if it can be demonstrated that the most likely alternative to the project would result in an allowable emission increase. In this case, the difference in emissions is used as the offset. Since the most likely alternative is hauling the waste to landfill, it is unlikely that enough NO_x emissions can be accumulated for offsets.

Assembly Bill 524 (Calvo) has been reviewed and does not appear to apply to the SWMC. Its intent appears to be to offer relief for electrical energy generation projects which SWMC is not. In addition, it provides that the project comply with the district's new source review rule.

PSD applications to EPA would be required for SO₂ and/or NO_x if their emissions individually exceeded 250 T/yr, which is equivalent to 1370 lbs/day (assuming 365 days/yr operation). Although PSD applications do not appear necessary (EPA is preparing to promulgate new guideline following a successful court challenge to previous guidelines), EPA expects applicants for permits to local agencies to demonstrate to EPA that they are exempt from PSD requirements by virtue of being below the emissions cut off point.

To summarize, the only serious obstacle to granting authority to construct to SWMC is the high NO_x emission level. It would be appropriate to bring this to the attention of the BAAQMD, as well as other background information, and determine its attitudes and policies. The BAAQMD could apprise the City of Berkeley of its intent to request emission offsets for NO_x or of approaches to mitigate the problem.

APPENDIX I

PROJECT DRAWINGS

SOLID WASTE MANAGEMENT CENTER

SECOND AND GILMAN STREETS

CONCEPTUAL DESIGN

CITY OF BERKELEY
DEPARTMENT OF PUBLIC WORKS

INDEX OF DRAWINGS ARCHITECTURAL

T 1 AREA, VICINITY, LOCATION MAPS, DRAWING INDEX

ENV 1 FLOW DIAGRAM, MATERIALS BALANCE

C 1 SITE SURVEY

C 2 SITE SURVEY

C 3 SITE PLAN, DEMOLITION, UTILITIES

C 4 SITE PLAN, ROOF PLAN

C 5 PHASED CONSTRUCTION

A 1 AREA MAP

A 2 SITE PERSPECTIVE

A 3 SEGMENT "A" PLAN, SCALE HOUSE, ADMINISTRATION

A 4 SEGMENT "B" PLAN, PROCESSING BUILDING

A 5 SEGMENT "C" PLAN, RECYCLING CENTER

A 6 BUILDING & EQUIPMENT SECTIONS

MECHANICAL

M 1 SEGMENT "A" PLAN (NORTH), SCALE HOUSE, ADMINISTRATION

M 2 SEGMENT "B" PLAN (CENTRAL), PROCESSING BUILDING

M 3 SEGMENT "C" PLAN (SOUTH), RECYCLING CENTER & SECTIONS

M 4 FLOW DIAGRAM

ELECTRICAL

E 1 ONE-LINE DIAGRAM

E 2 SUBSTATION PLAN, ELEVATION AND MOTOR LIST

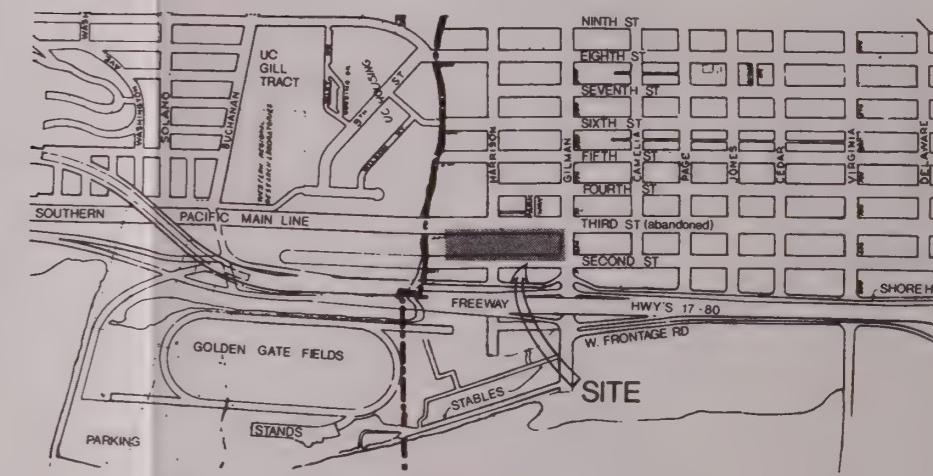
E 3 SEGMENT "A" PLAN, LIGHTING & POWER, SCALE HOUSE, ADMINISTRATION

E 4 SEGMENT "B" PLAN, LIGHTING & POWER, PROCESSING BUILDING

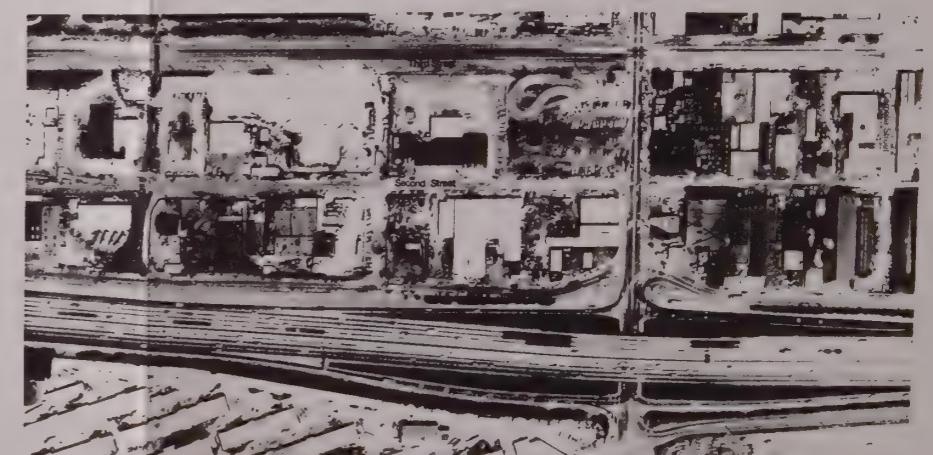
E 5 SEGMENT "C" PLAN, AREA LIGHTING AND POWER, AND SYMBOL LIST



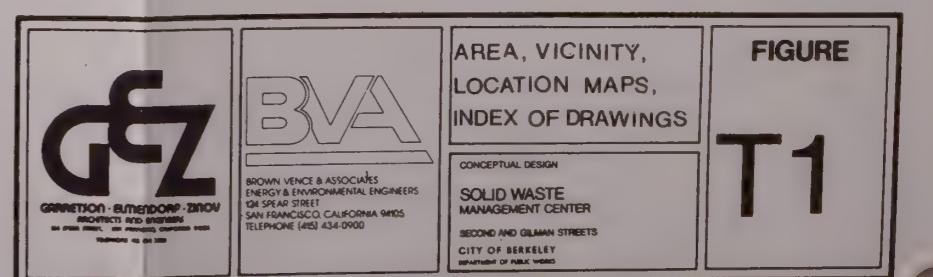
1 AREA MAP
T1
2 1 4 0 1, 3 6 10



2 VICINITY MAP
T1
900 450 0 100 300 600 1000 1500 2100



3 LOCATION MAP
T1
200 100 50 0 100 300 600



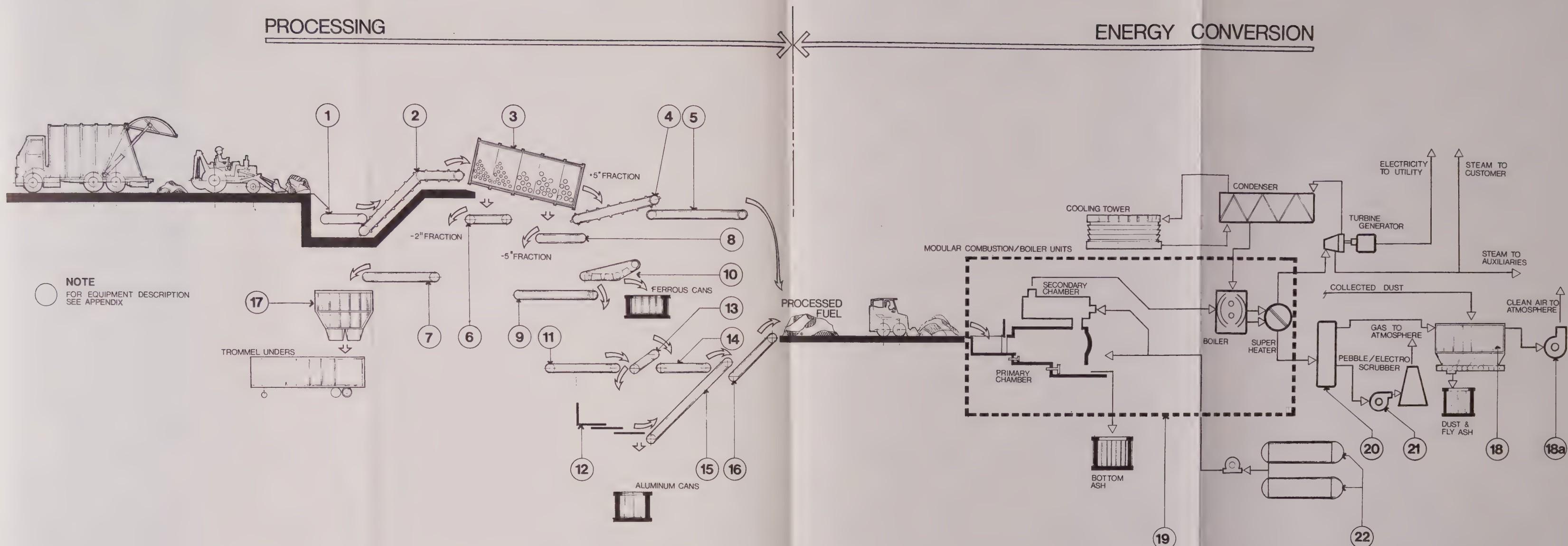
AREA, VICINITY,
LOCATION MAPS,
INDEX OF DRAWINGS

FIGURE
T1

CONCEPTUAL DESIGN
SOLID WASTE
MANAGEMENT CENTER
SECOND AND GILMAN STREETS
CITY OF BERKELEY
DEPARTMENT OF PUBLIC WORKS

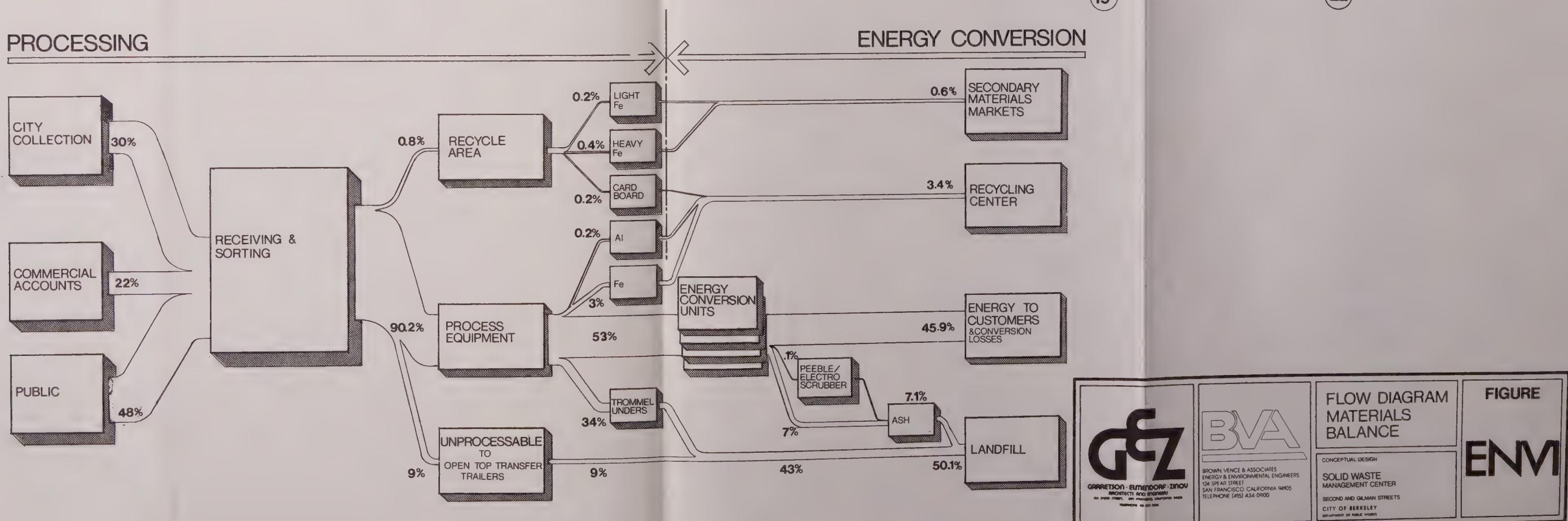
PROCESSING

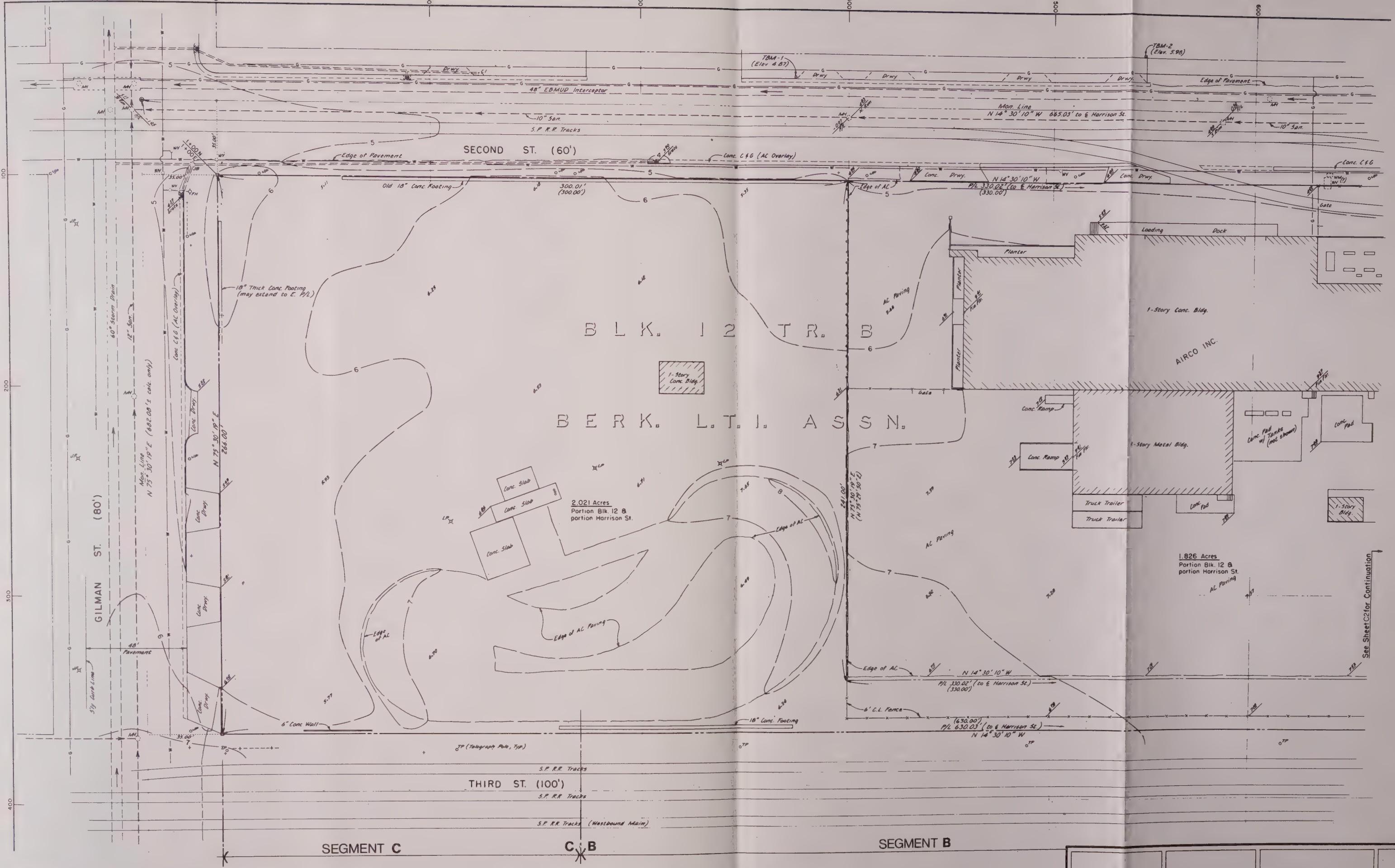
ENERGY CONVERSION



PROCESSING

ENERGY CONVERSION





RECOMMEND APPROVAL:
SENIOR CIVIL ENGINEER
APPROVED:
DIRECTOR OF PUBLIC WORKS

DATE 4-5-77
R.C.E. 1018
DATE 4-2-77
R.C.E. 8585

CITY OF BERKELEY
DEPARTMENT OF PUBLIC WORKS

PROPOSED TRANSFER STATION
SITE PLAN

DESIGN DRAWN L.F.M. HORIZ. 1" = 20' PLAN 6495
CHECK J.L.B. VERT. M.176 SHEET 2 OF 2
AS BUILT J.M. BOOK M.195 DATE Mar. '77

10 0 10 30 50

1 C1 SITE SURVEY

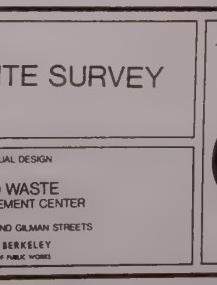
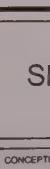
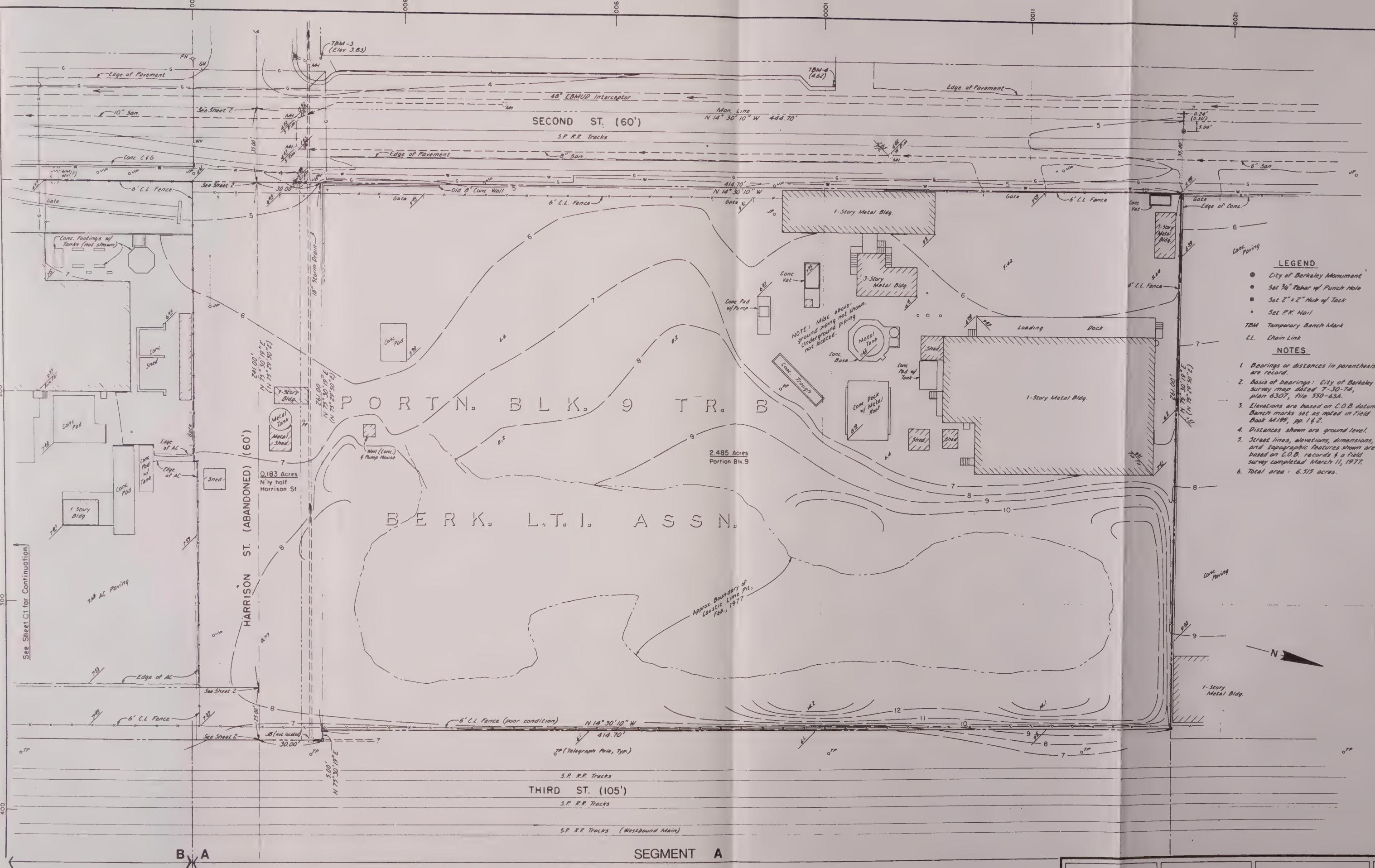


FIGURE
C1



RECOMMEND APPROVAL:
SENIOR CIVIL ENGINEER
APPROVED:
DIRECTOR OF PUBLIC WORKS

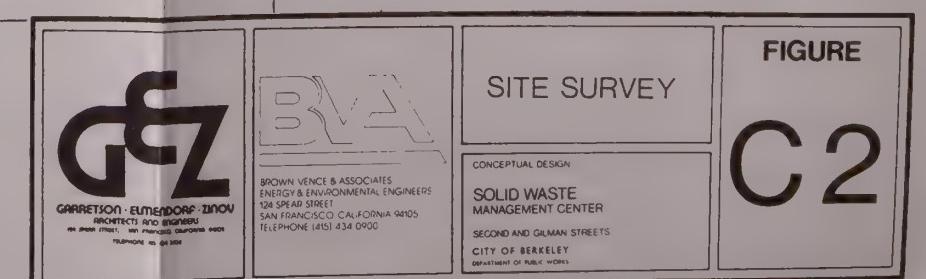
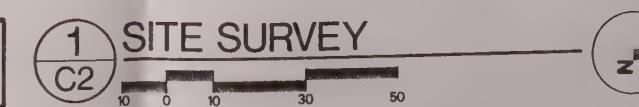
DATE 4-5-77
R.C.E. 1058
DATE 4-5-77
R.C.E. 6585

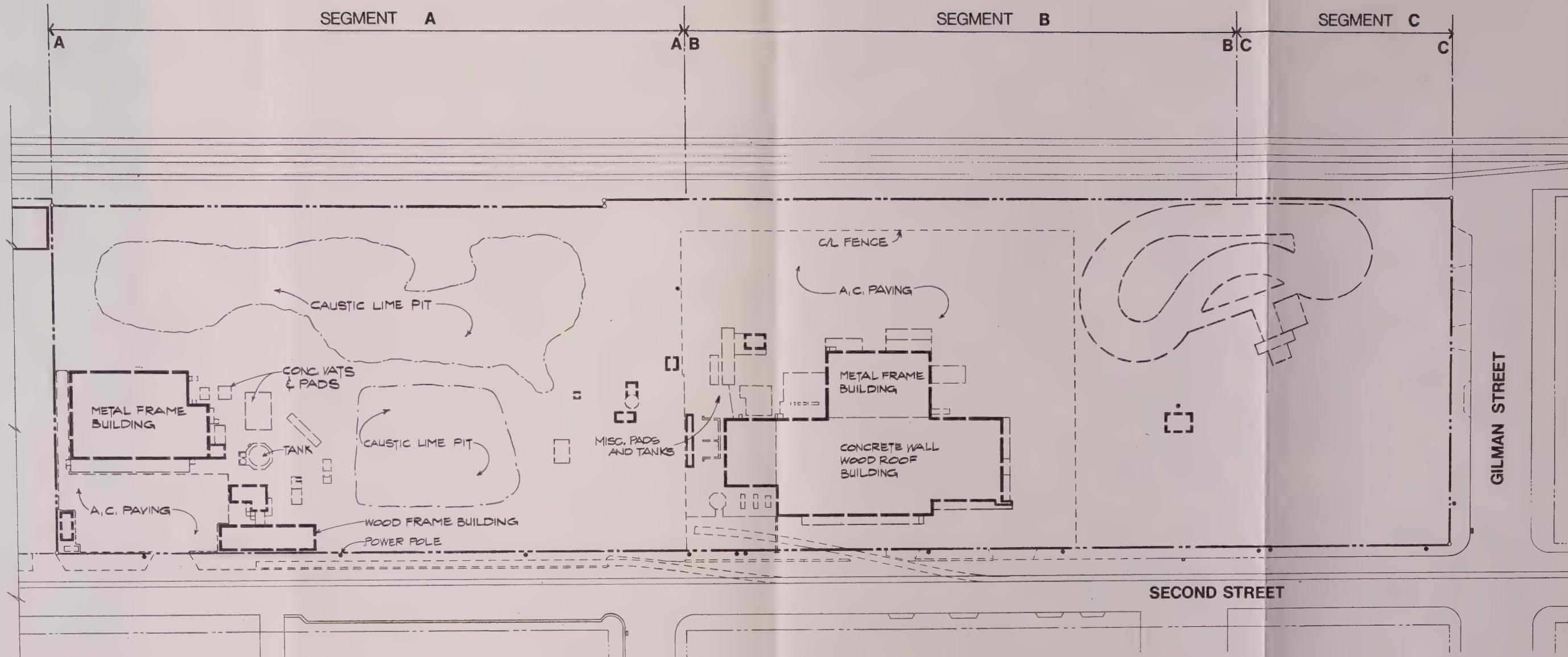
CITY OF BERKELEY
DEPARTMENT OF PUBLIC WORKS

PROPOSED TRANSFER STATION
SITE PLAN

DESIGN DRAWN L.F.M. HORIZ. 1" = 20' PLAN 6495
CHECK J.L.B. VERT. M-176 SHEET 1 OF 2
AS BUILT BOOK M-195 DATE Mar. '77 FILE 550-57

SEGMENT A





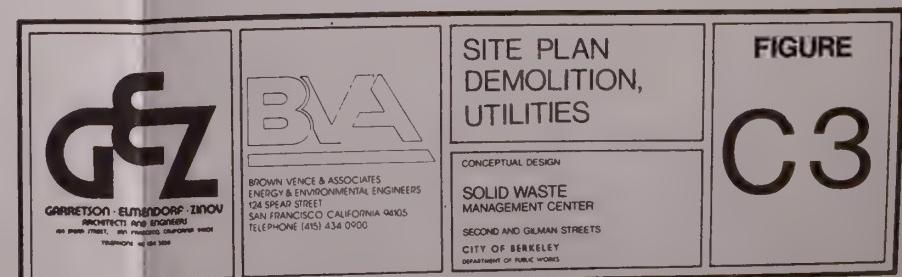
NOTES

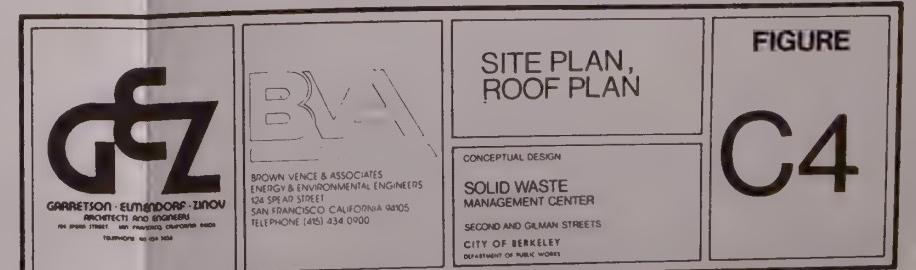
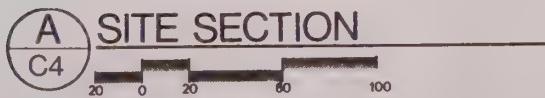
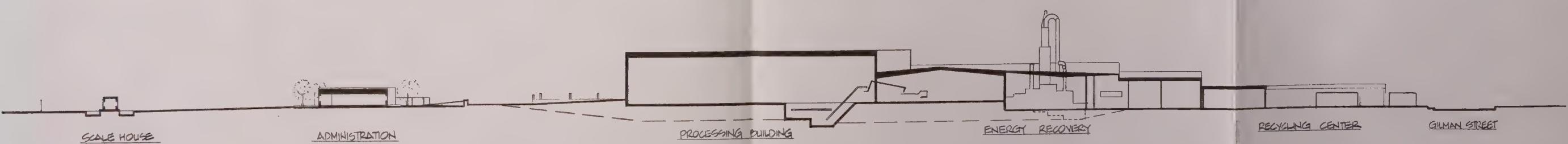
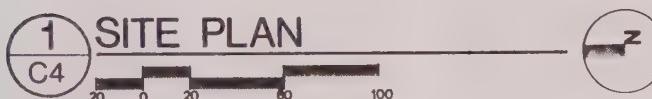
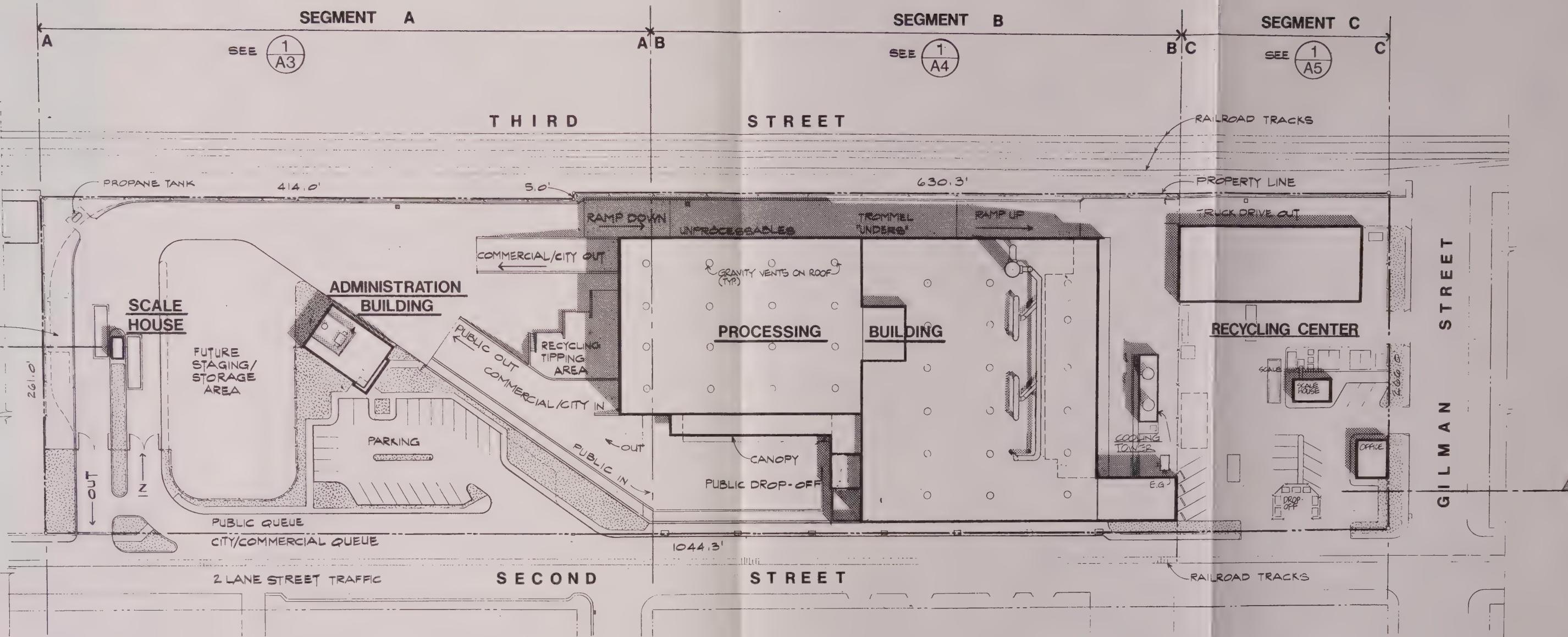
REMOVE ALL BUILDINGS, PAVING, MISCELLANEOUS CONCRETE STRUCTURES, POWER POLES AND MAJOR UTILITY SERVICES AS SHOWN.

REMOVE LIME TO DEPTH TO ALLOW COVERAGE WITH 4 FOOT MINIMUM COMPACTED IMPORTED FILL.

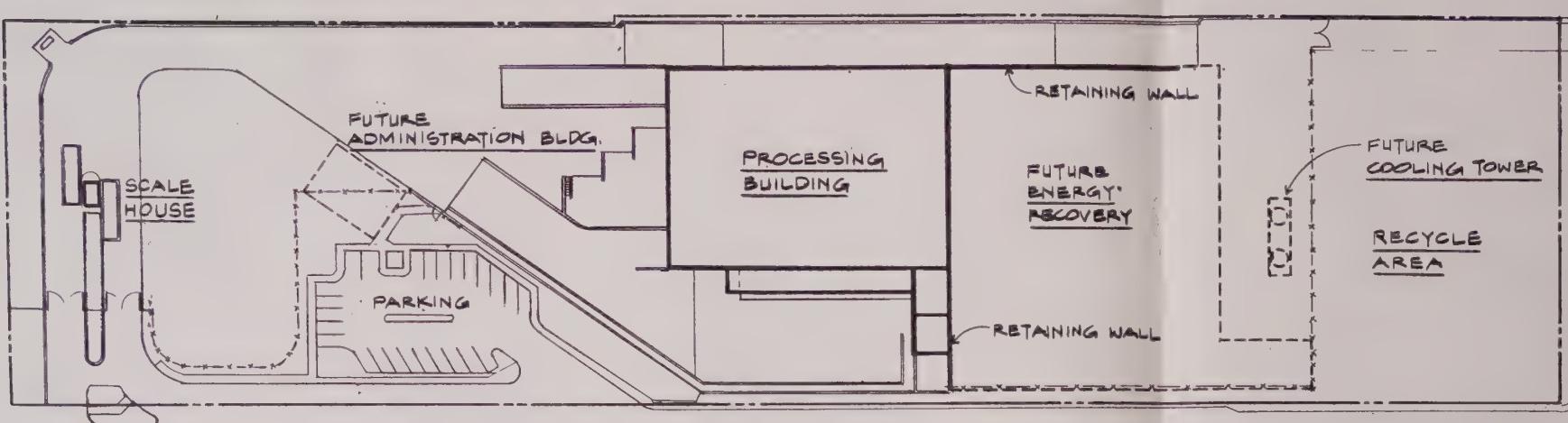
1 C3 DEMOLITION PLAN

20 0 20 60 100

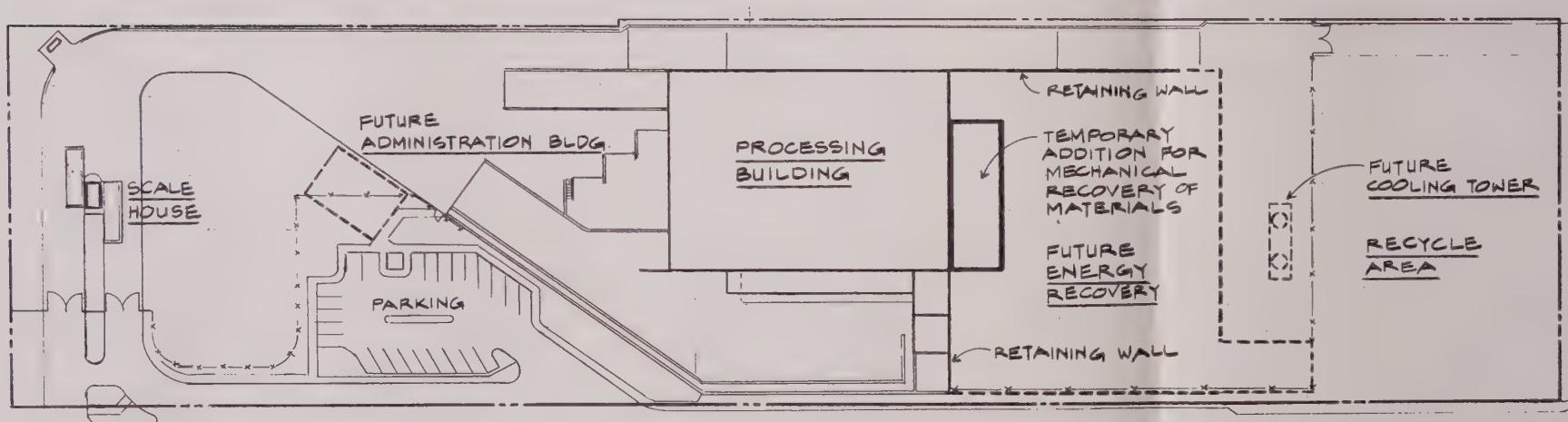




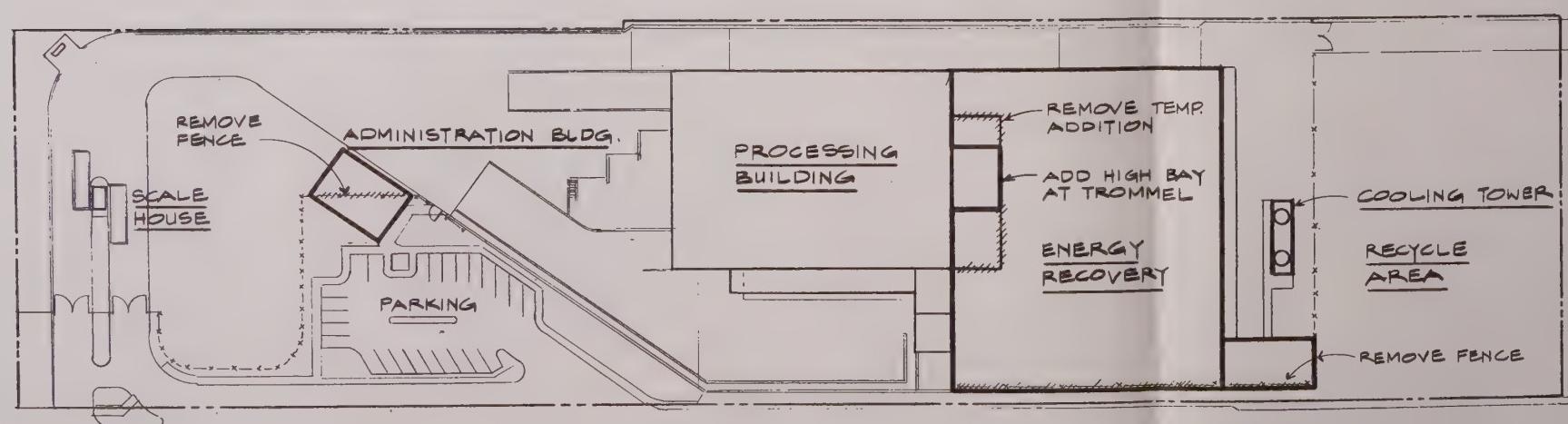
PHASE 1 TRANSFER AND HAULING

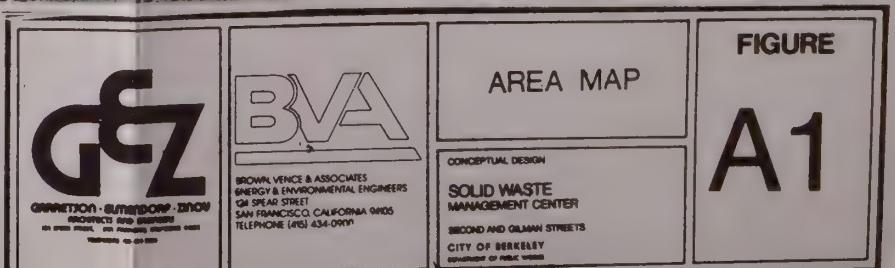
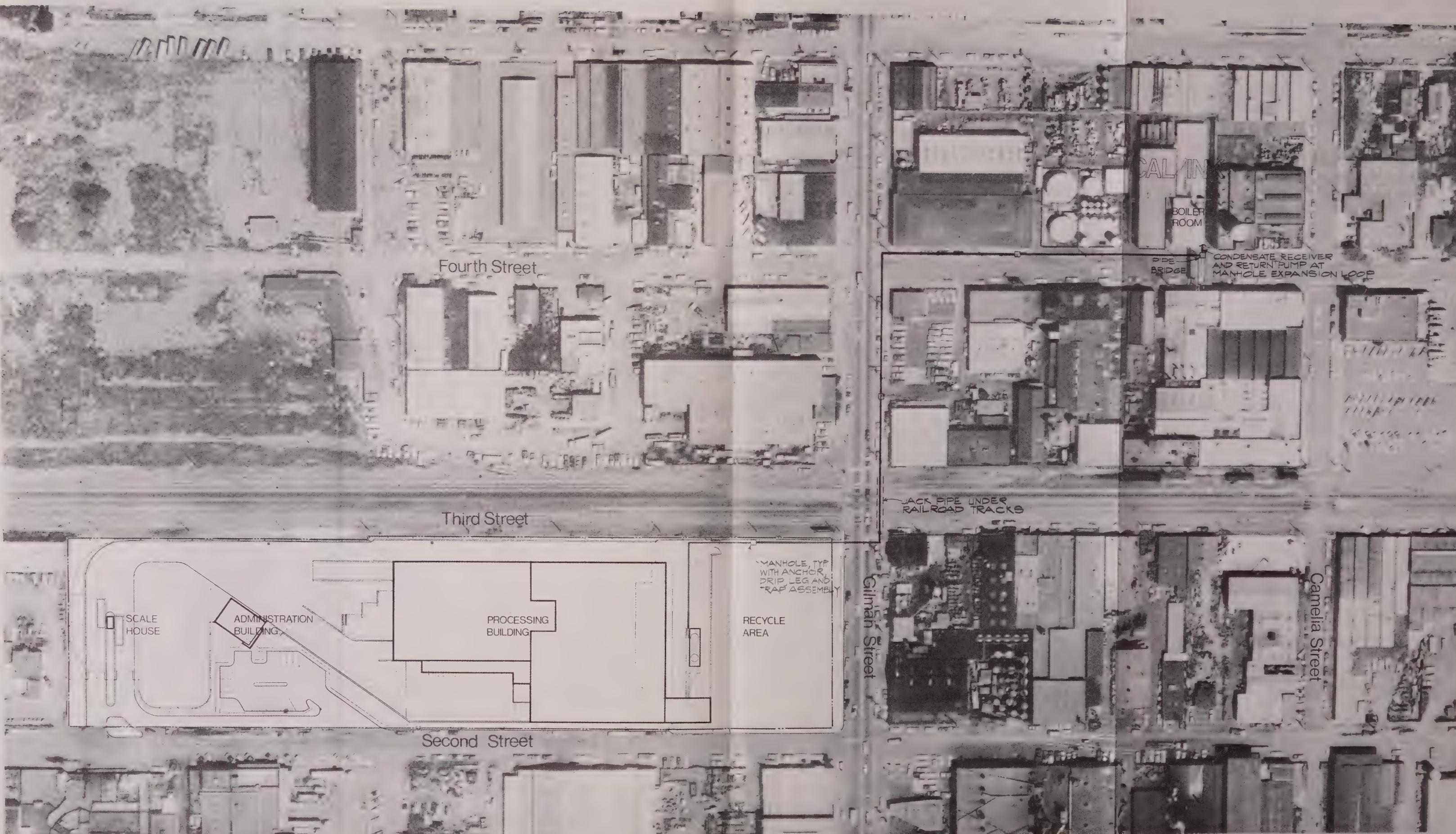


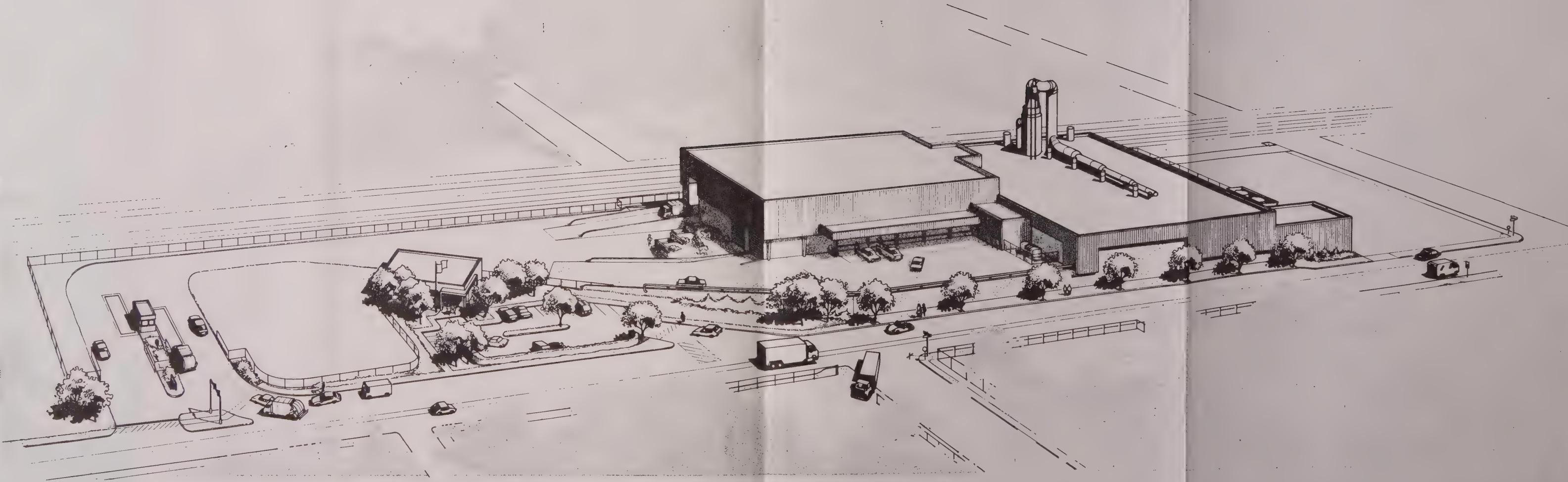
PHASE 2 TRANSFER AND HAULING WITH MECHANICAL RECOVERY



PHASE 3 ENERGY RECOVERY

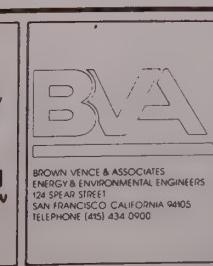
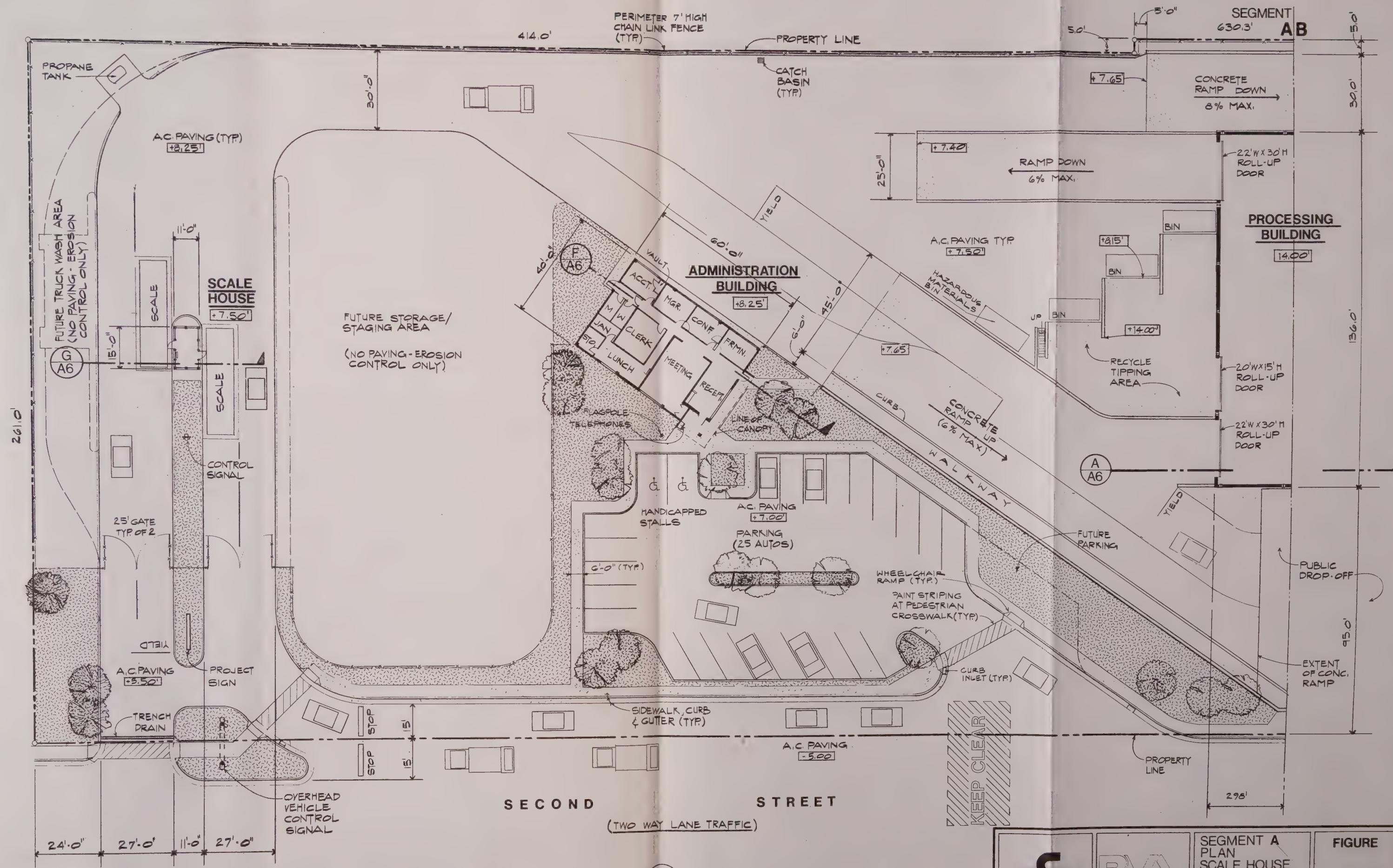






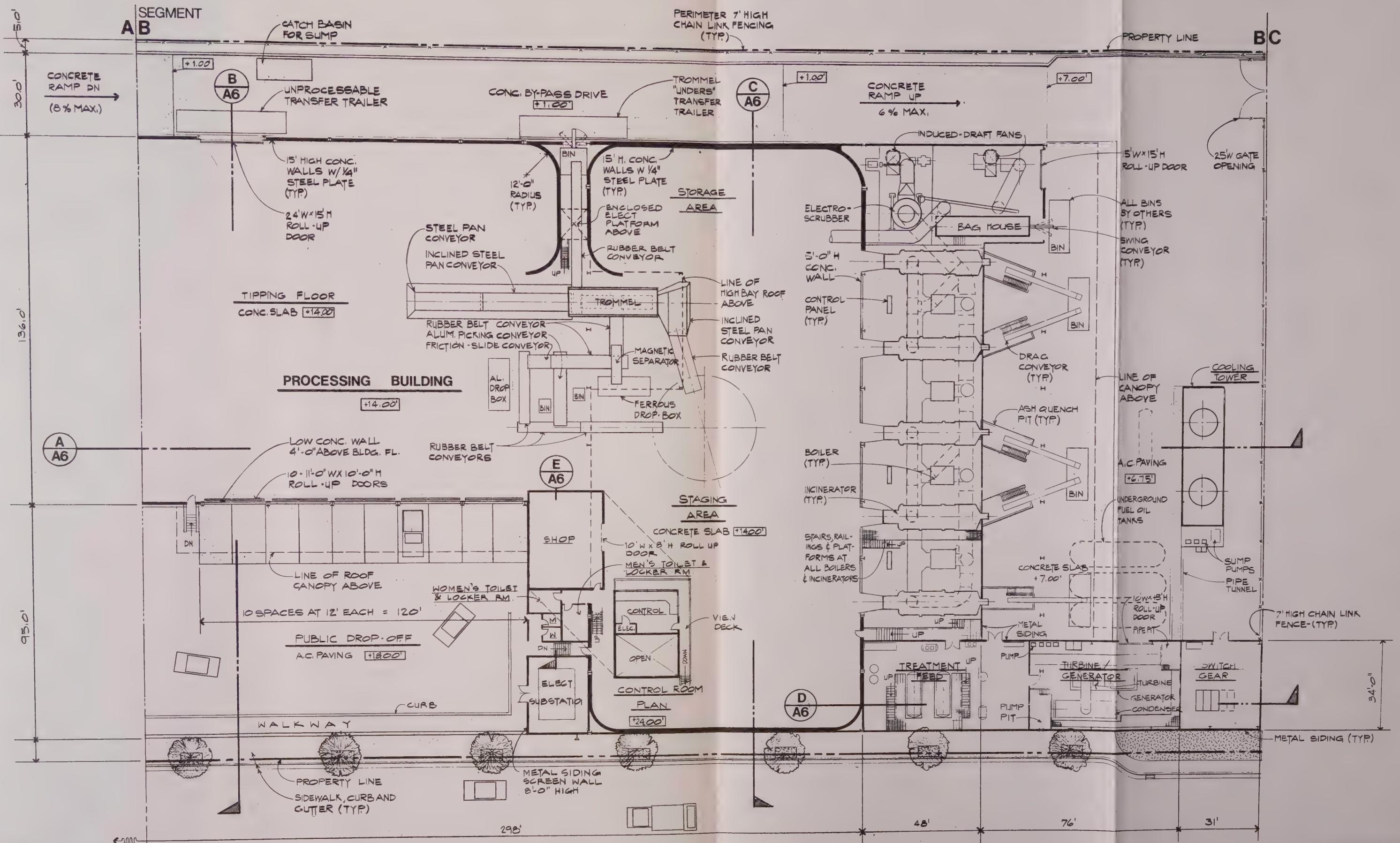
SITE PERSPECTIVE





SEGMENT A PLAN
SCALE HOUSE ADMINISTRATION
CONCEPTUAL DESIGN
SOLID WASTE MANAGEMENT CENTER
SECOND AND GILMAN STREETS
CITY OF BERKELEY
DEPARTMENT OF PUBLIC WORKS

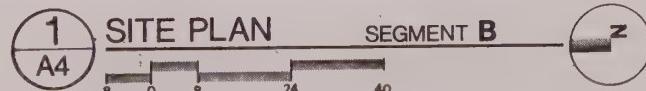
FIGURE
A3



NOTES

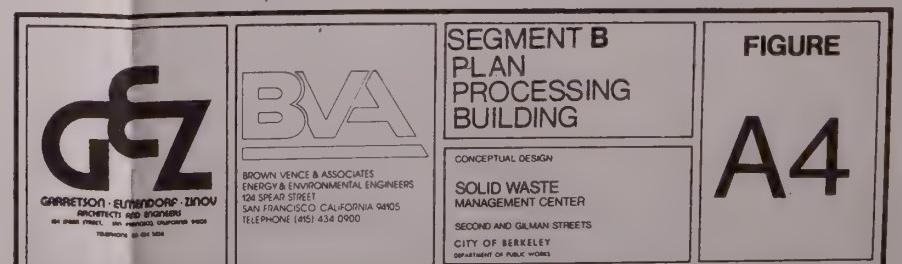
ELEVATIONS AS INDICATED ARE TAKEN
AS BEING ABOVE MEAN SEE LEVEL

FOR OTHER SITE UTILITIES SEE DRAWINGS M-1,
M-2, E-3 AND E-4.



SECOND STREET

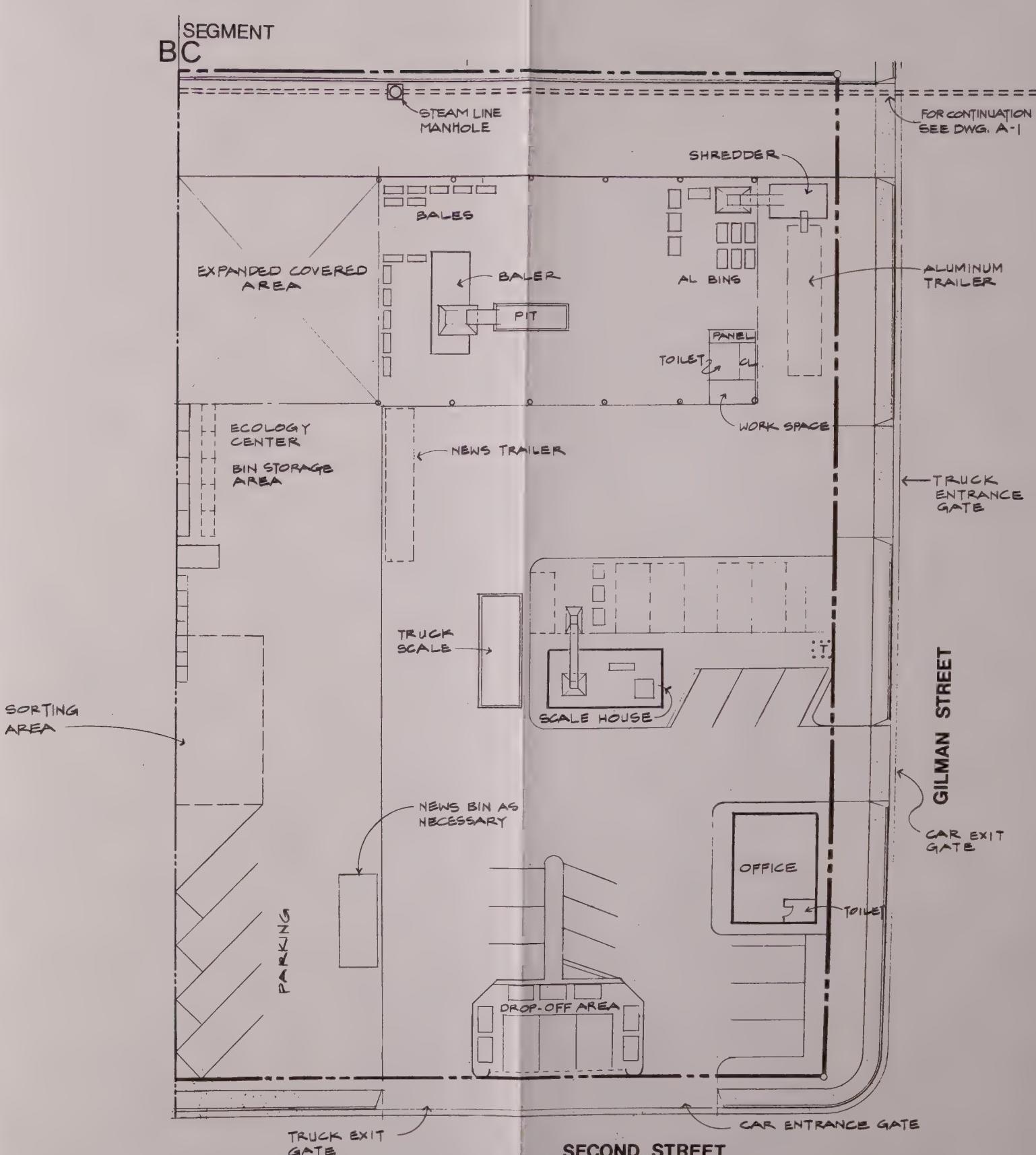
2 - LANE TRAFFIC



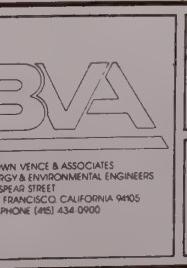
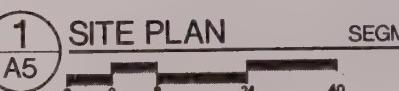
NOTE:

INFORMATION SHOWN ON THIS
PLAN WAS PROVIDED BY THE
CITY OF BERKELEY.
CONFIGURATION NOT DETERMINED
BY G.E.Z / B.V.A.

SEGMENT
BC



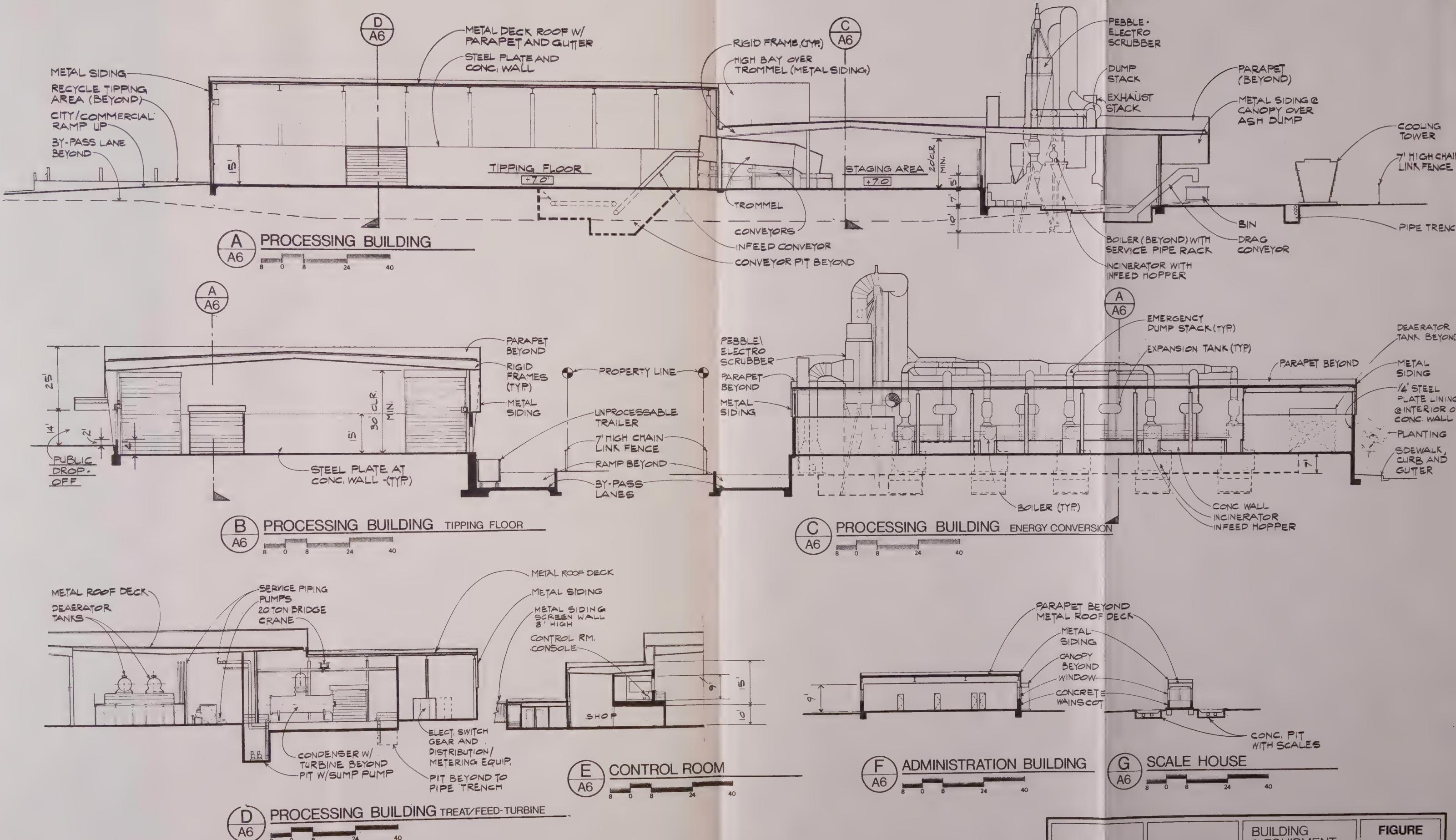
SECOND STREET
2-LANE TRAFFIC

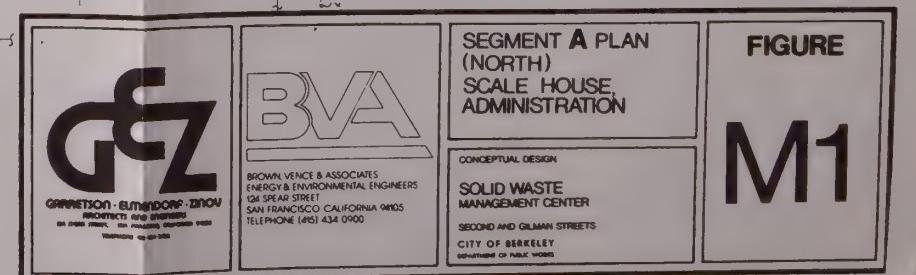
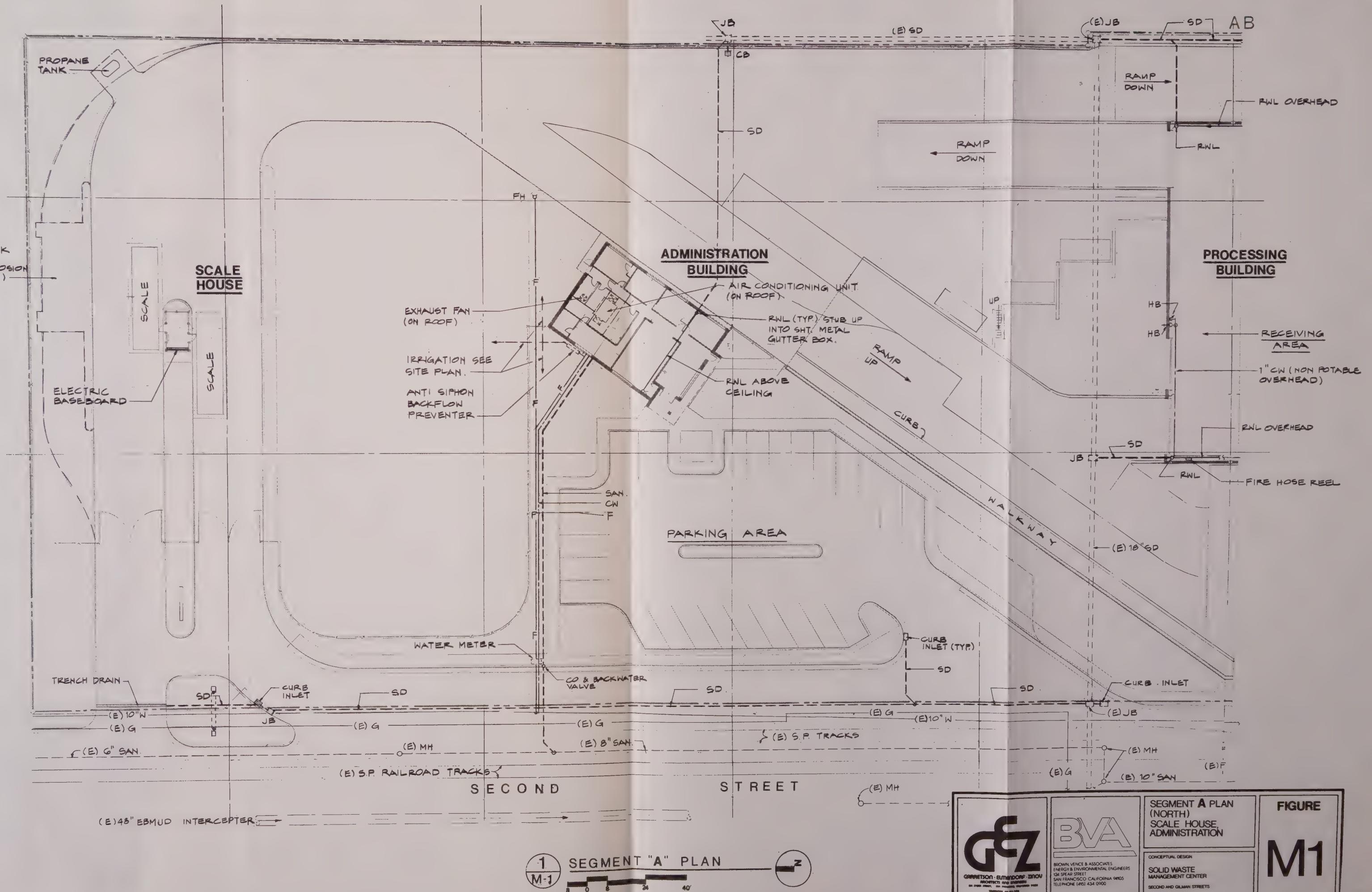


**SEGMENT C PLAN
RECYCLING CENTER**

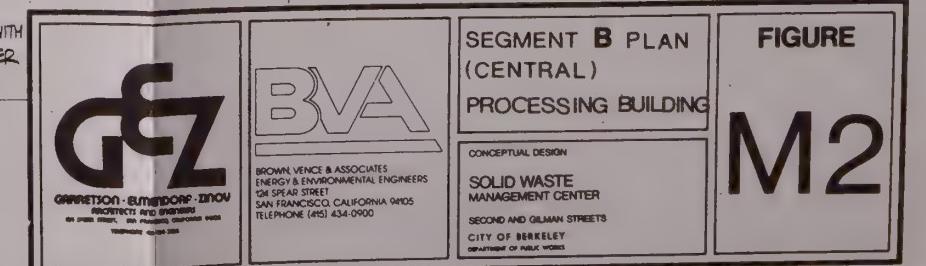
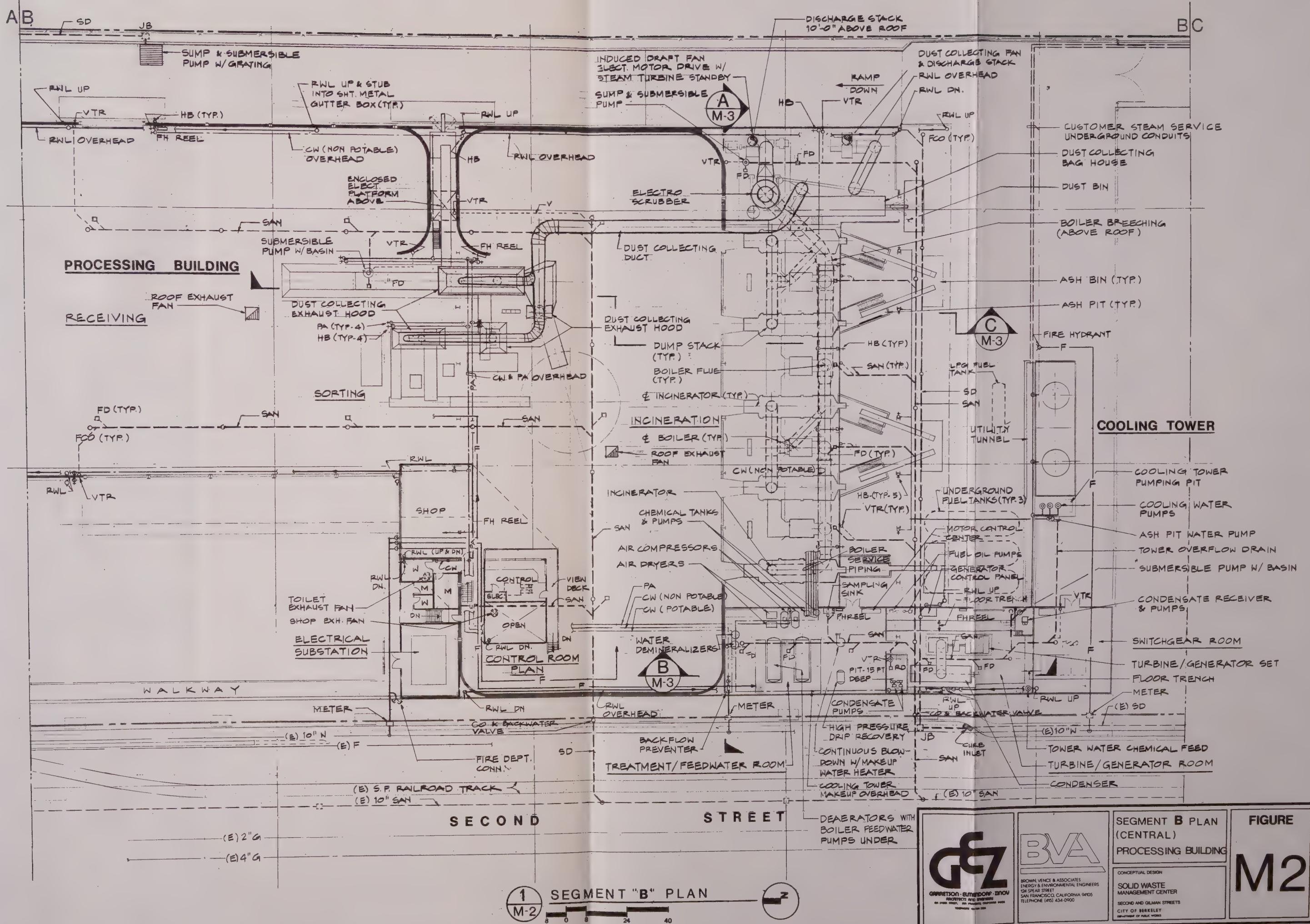
CEPTUAL DESIGN
SOLID WASTE
MANAGEMENT CENTER
OND AND GILMAN STREETS
Y OF BERKELEY
TMENT OF PUBLIC WORKS

FIGURE A5

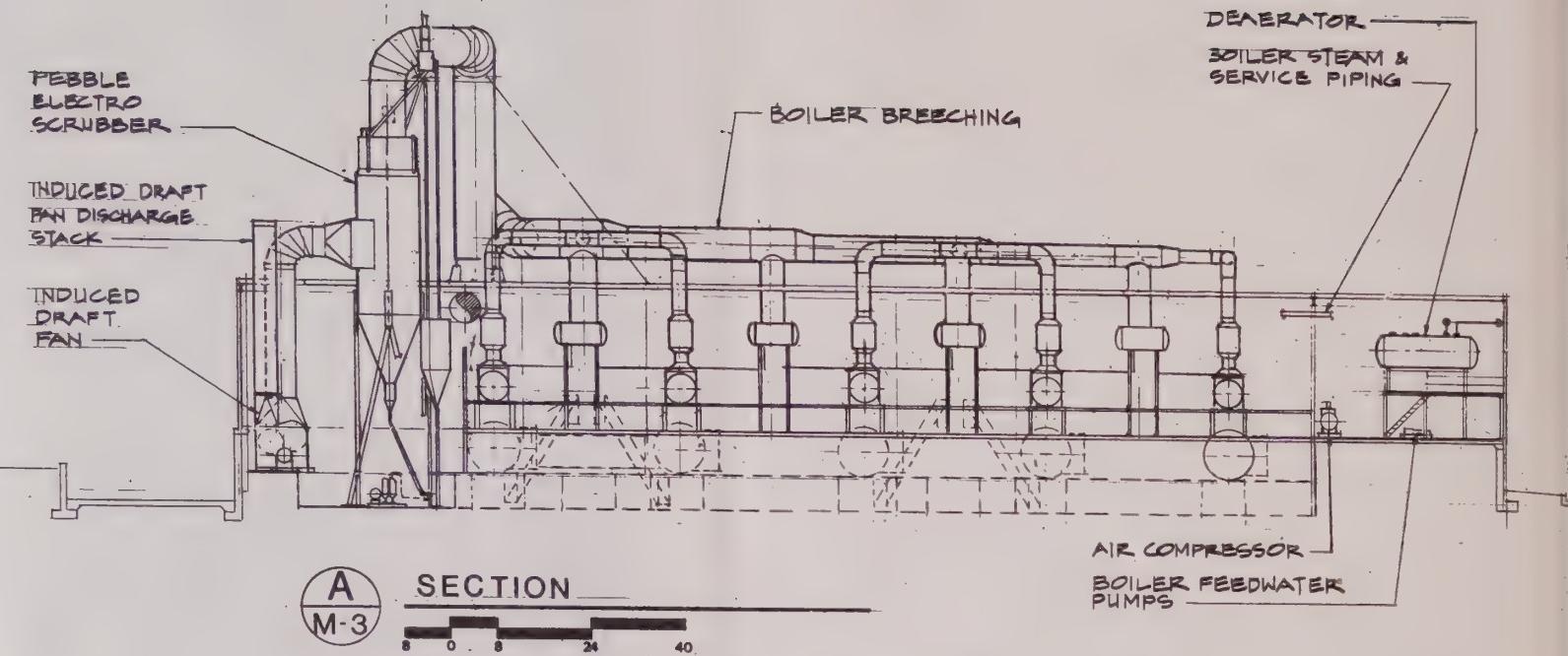






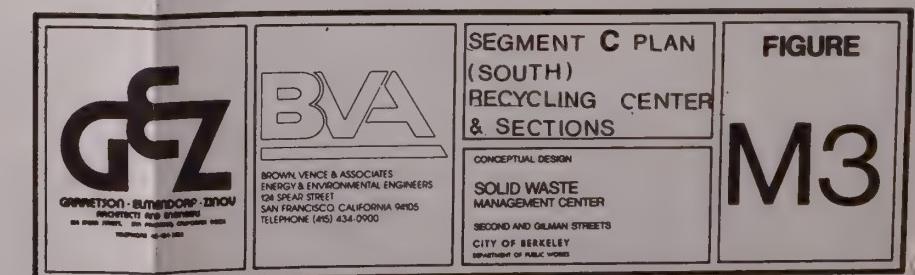
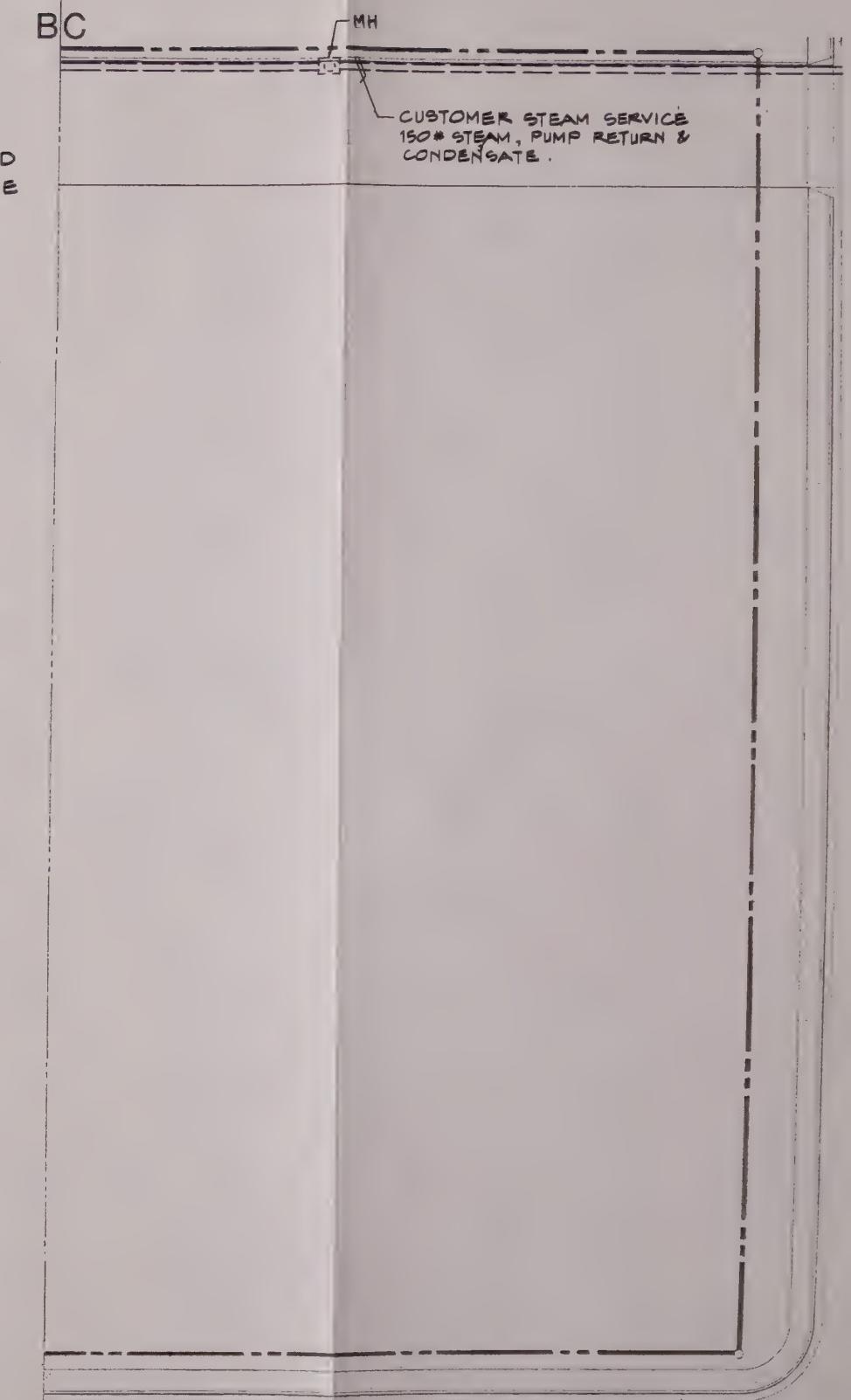
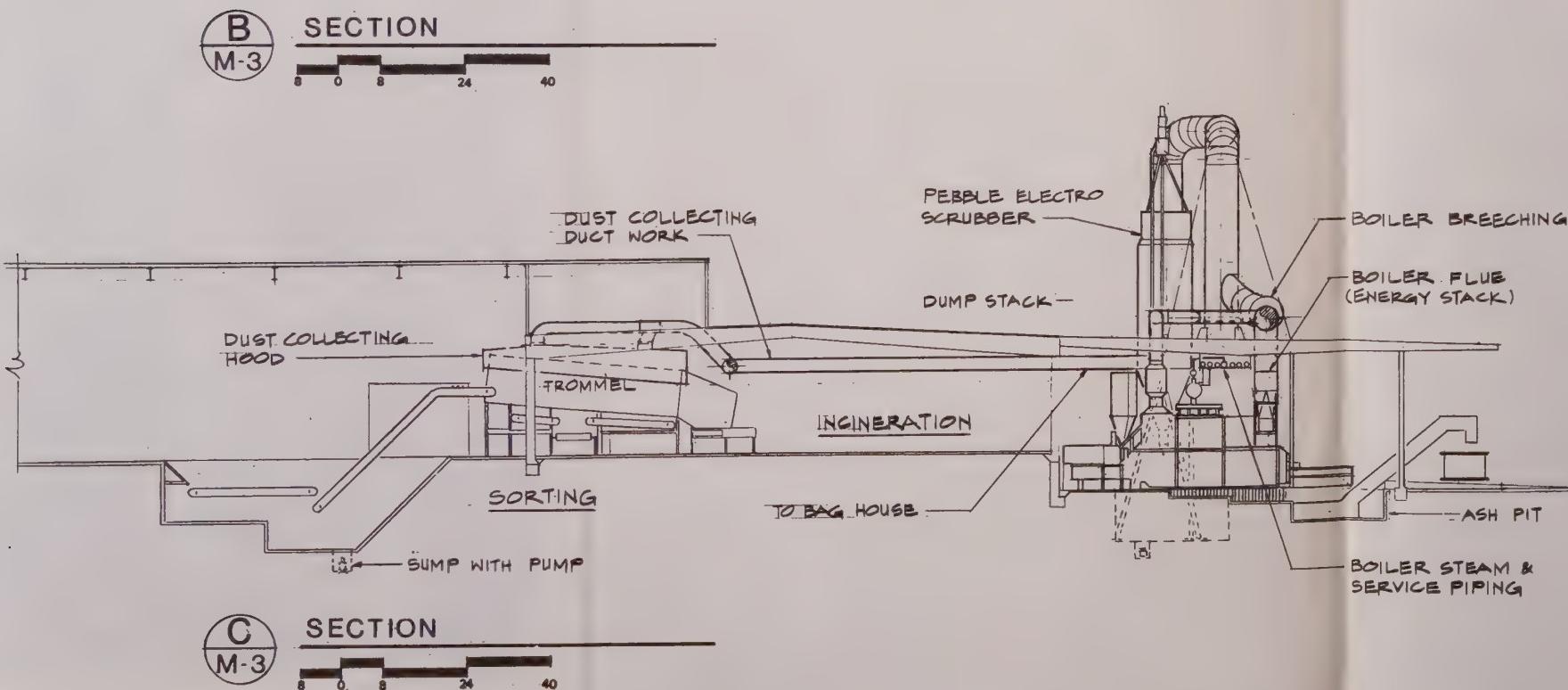
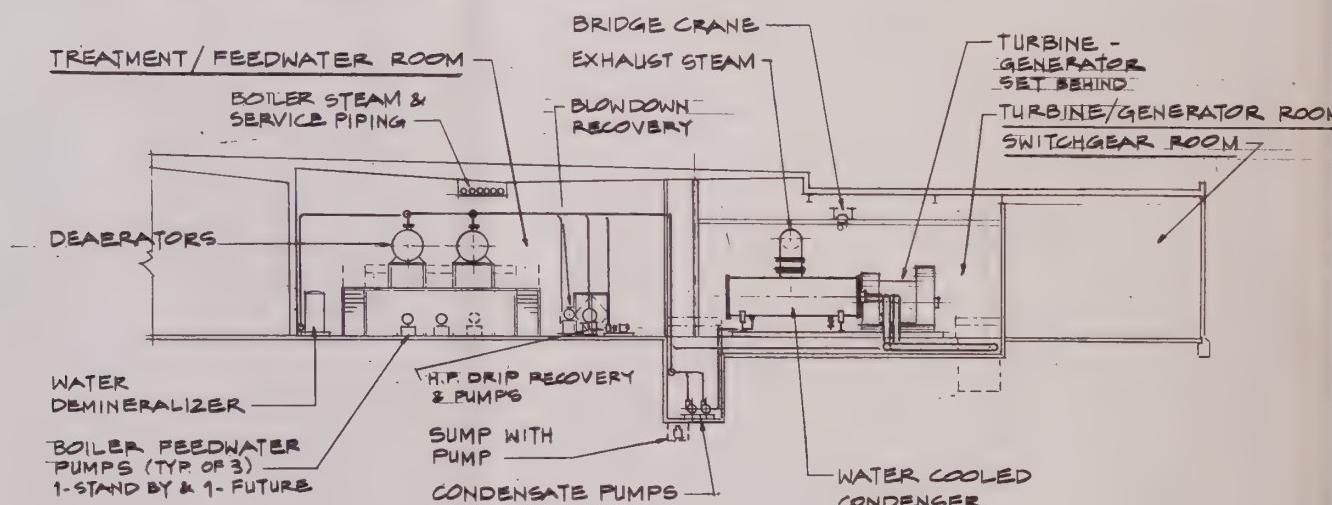


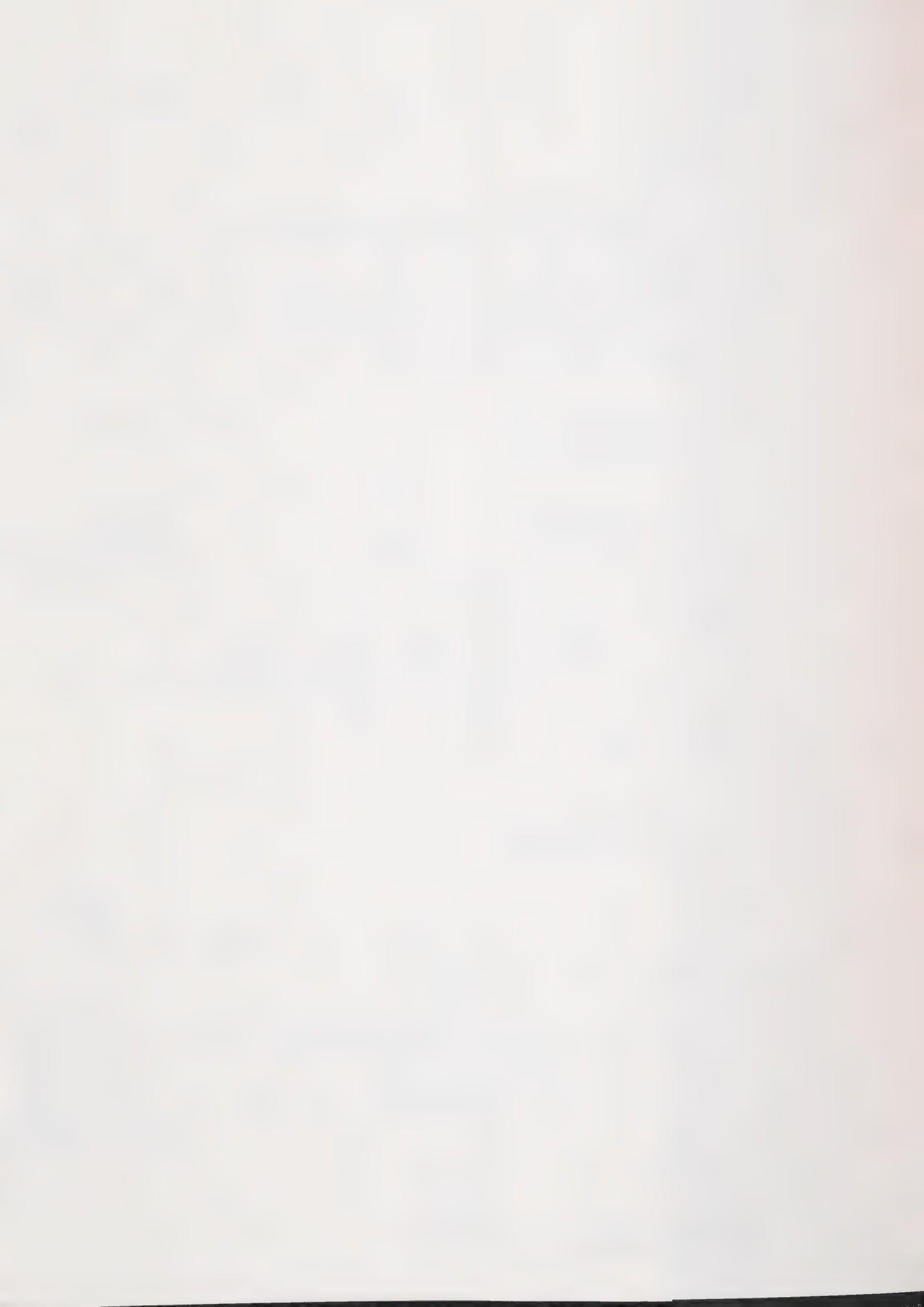


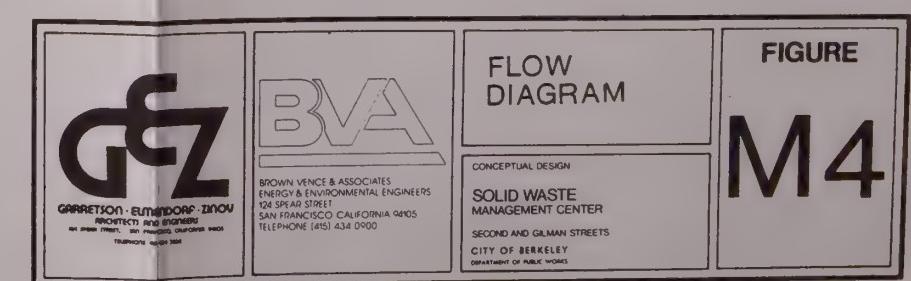
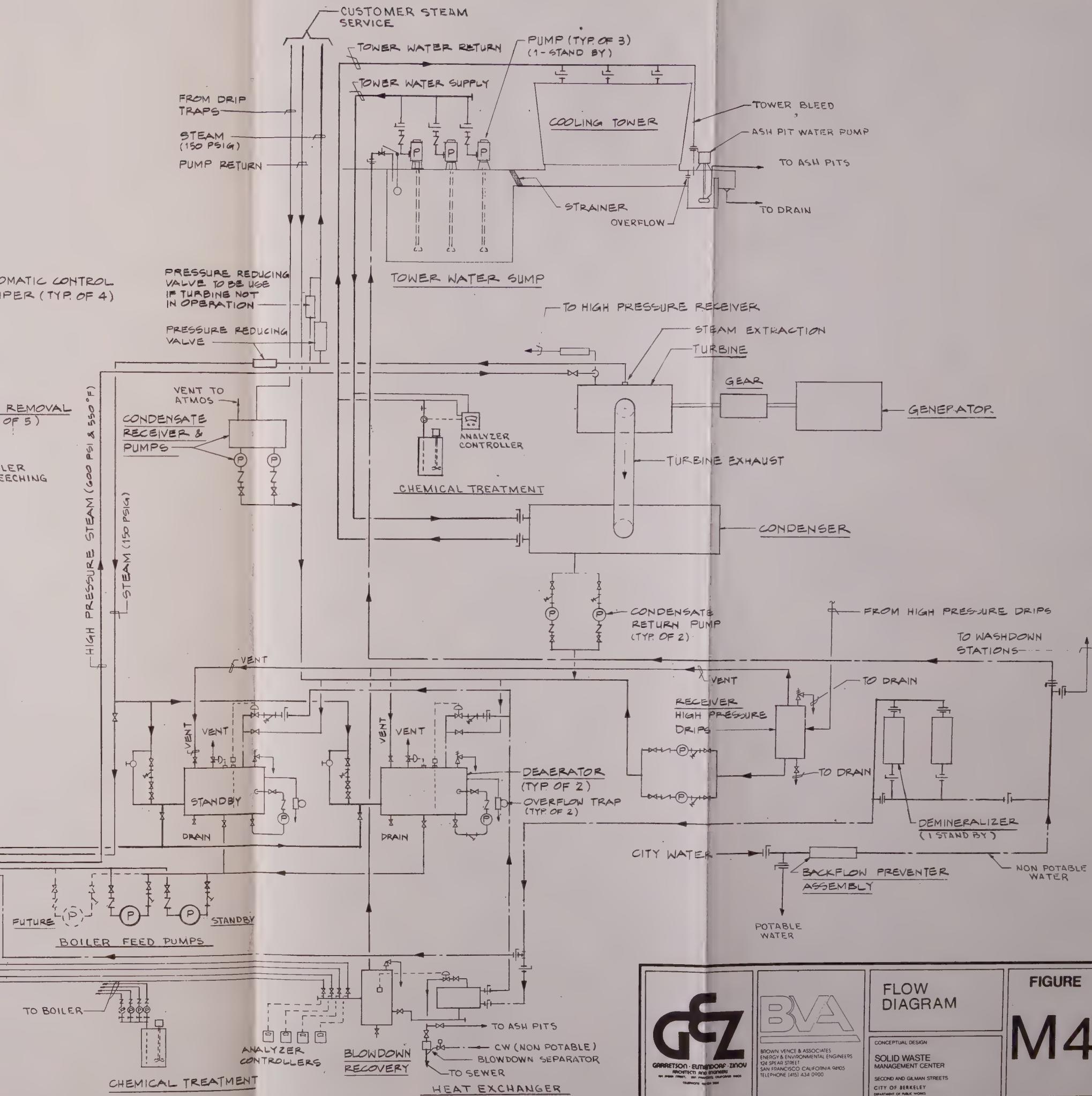
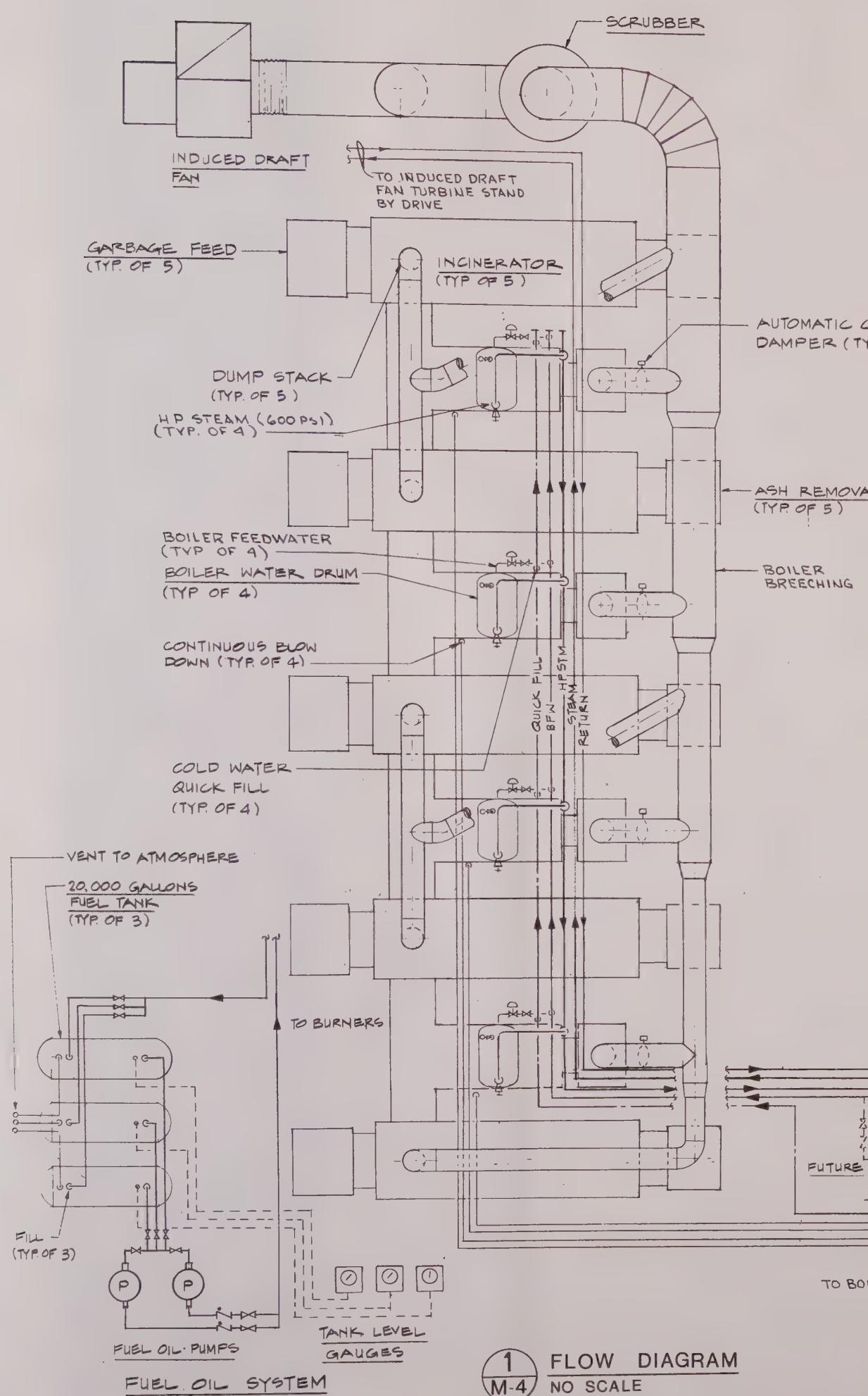


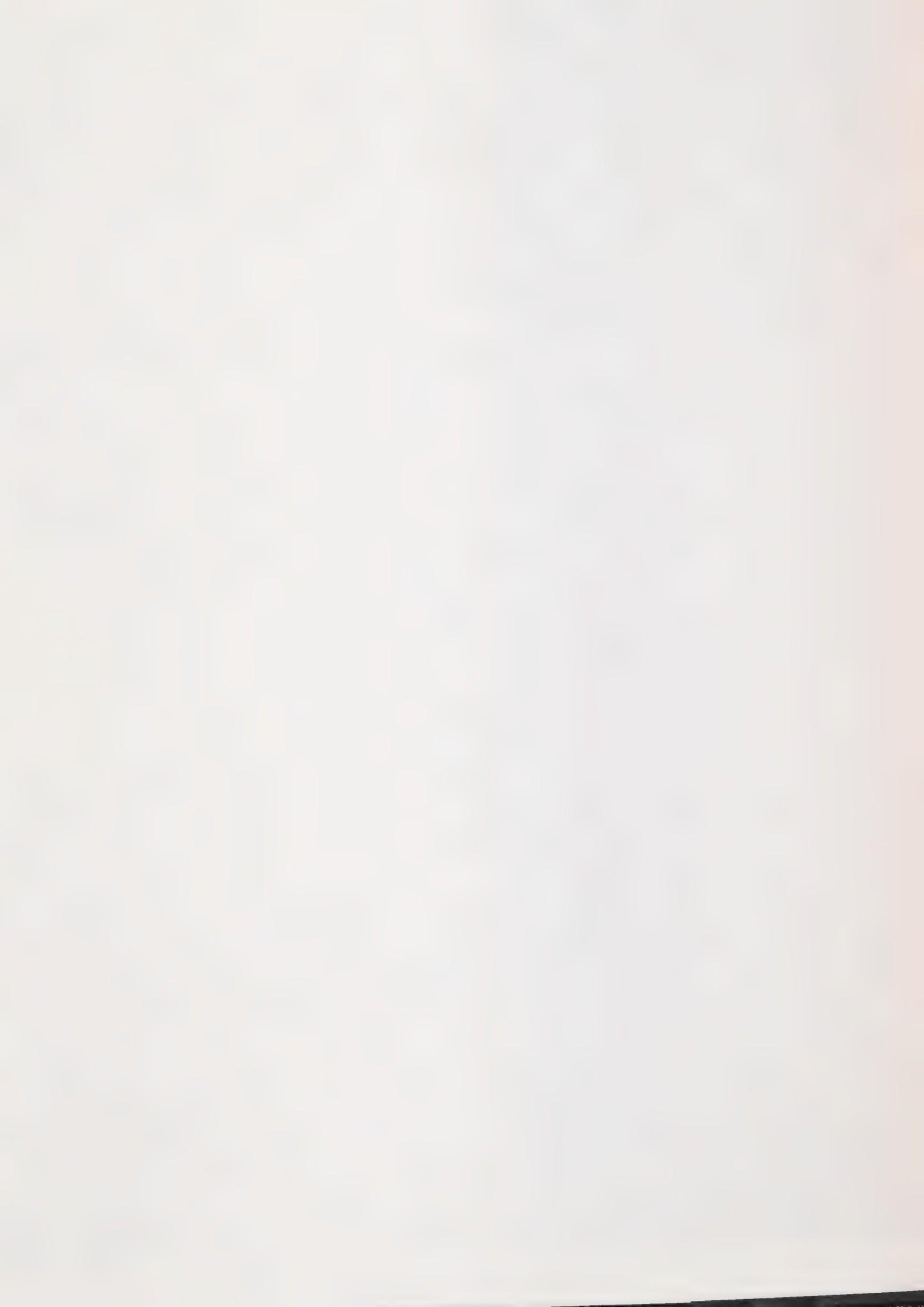
LEGEND

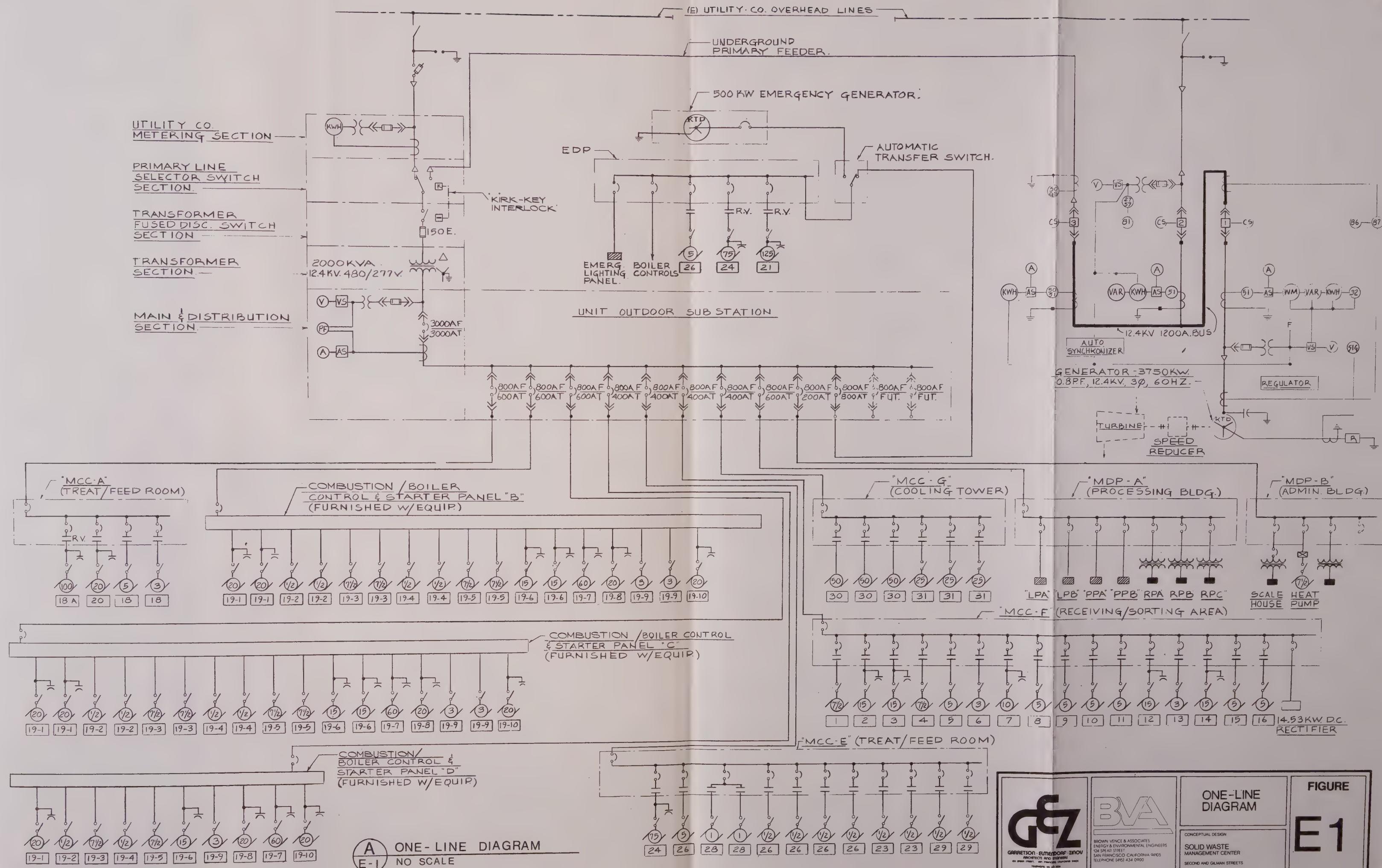
(E)	PIPE ABOVE GROUND
G	UNDER GROUND PIPE
W	EXISTING
F	GAS
CW	WATER
CTEL	FIRE LINE
	COLD WATER
	CONNECT TO EXISTING
	LINE
PA	PLANT AIR
CB	CATCH BASIN
JB	JUNCTION BOX
SD	STORM DRAIN
SAN.	SANITARY SEWER
V	VENT
VTR	VENT THRU ROOF
RWL	RAINWATER LEADER
MH	MANHOLE
FD	FLOOR DRAIN
HB	HOSE BIBB
F.H. REEL	FIRE HOSE REEL
FCO	FLOOR CLEANOUT



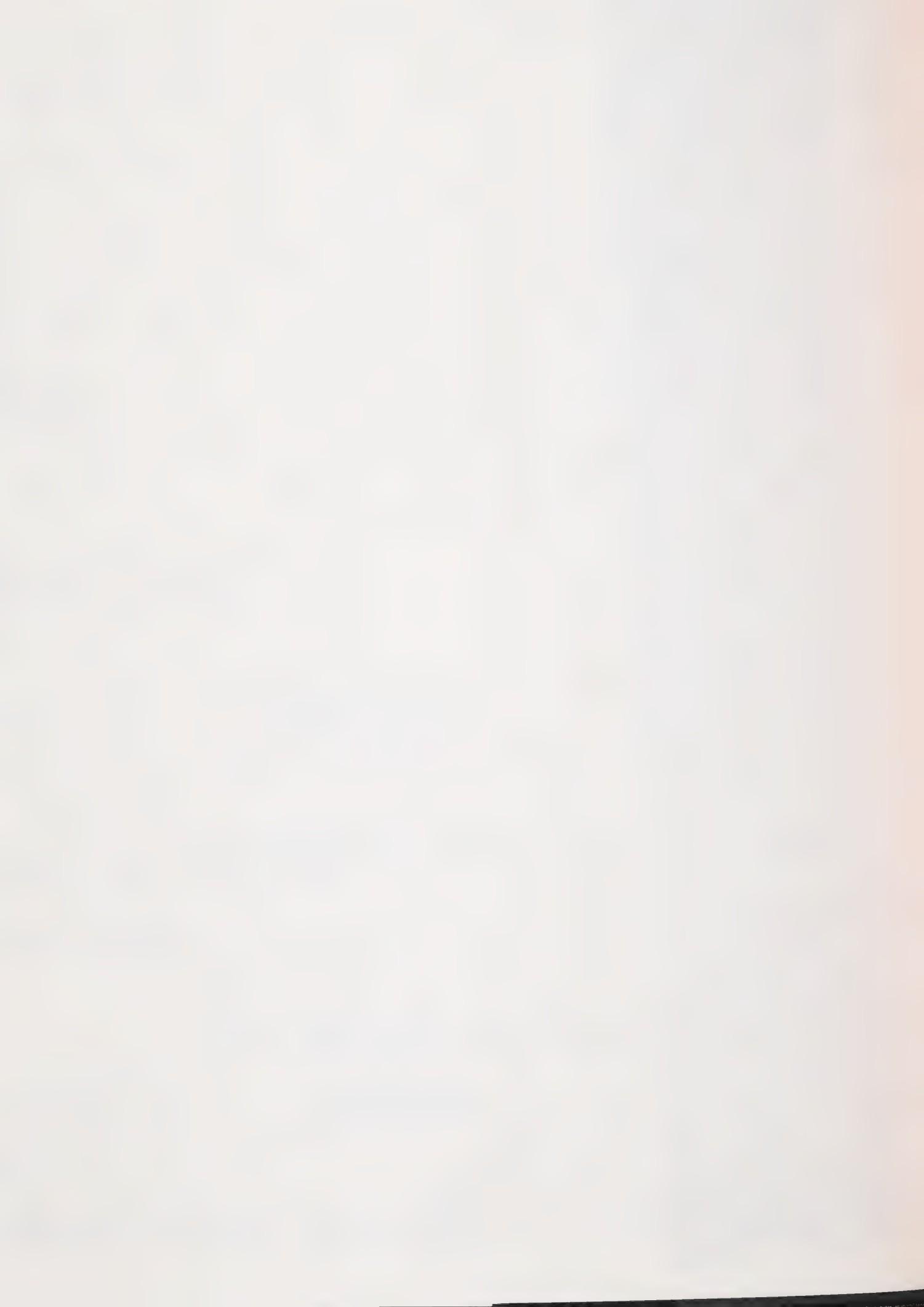


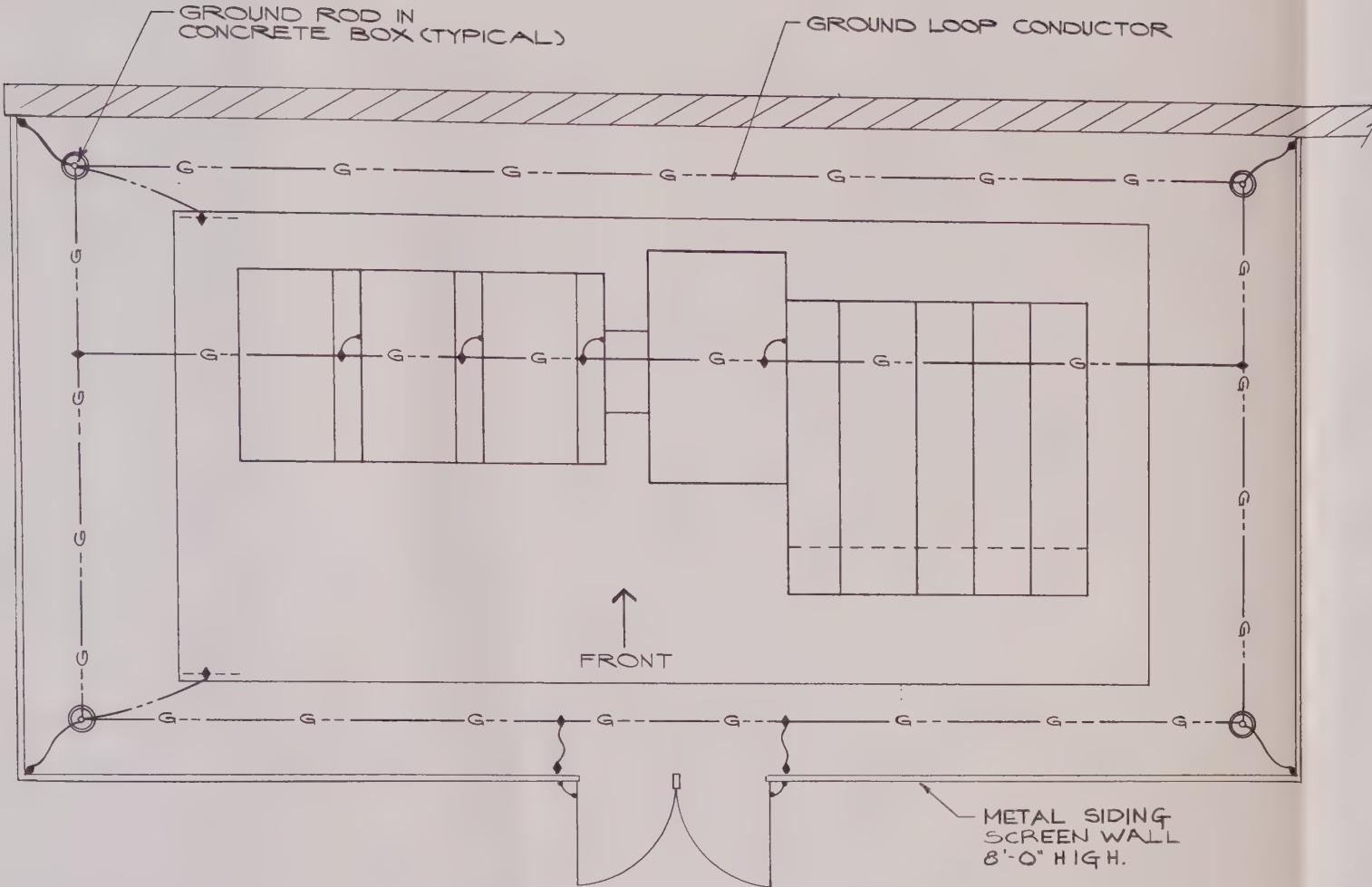




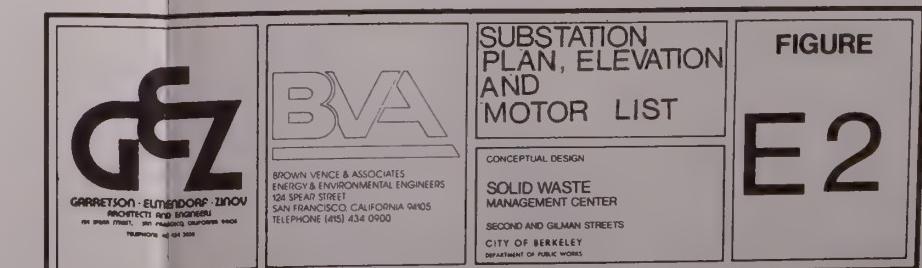
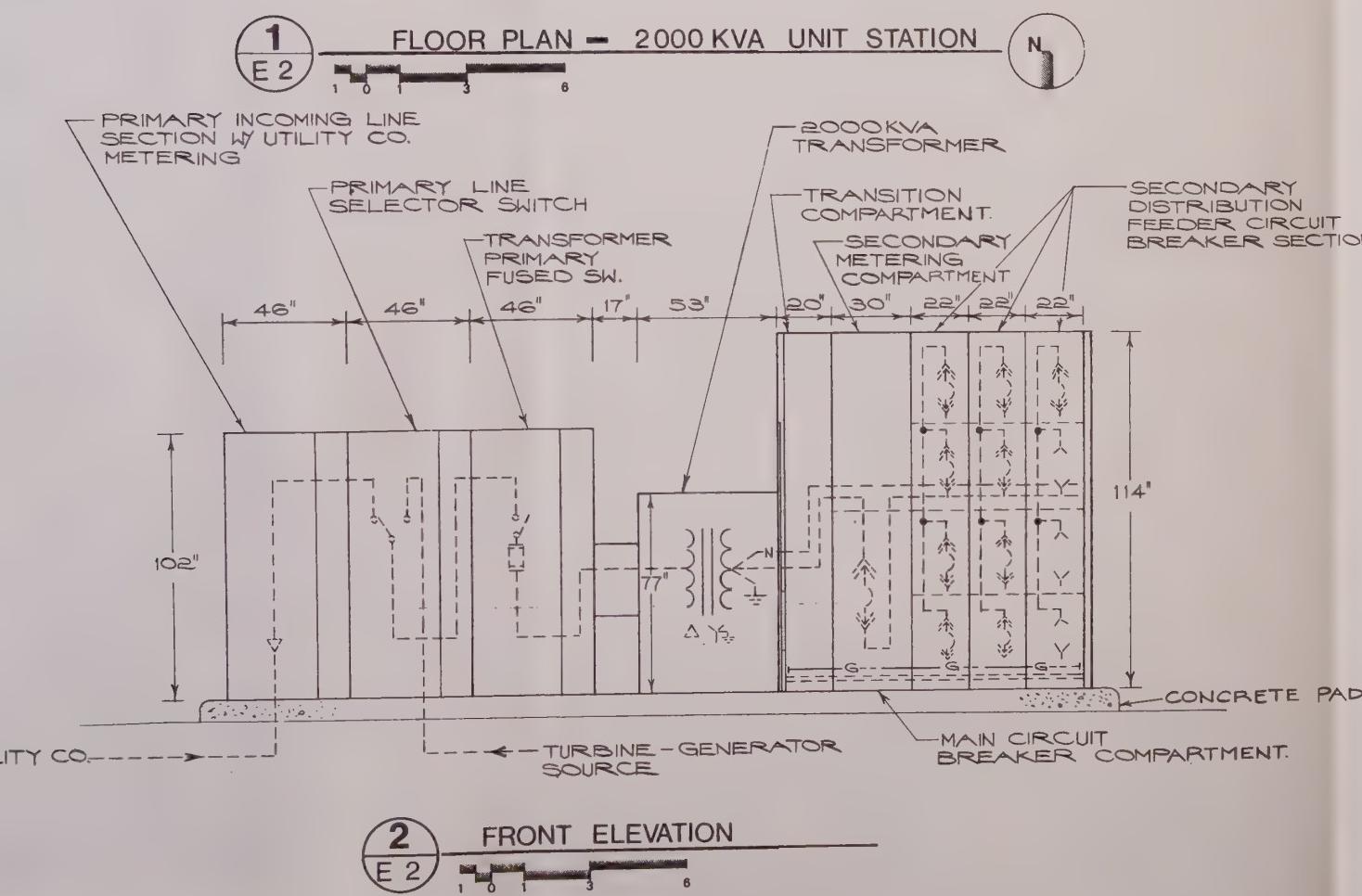


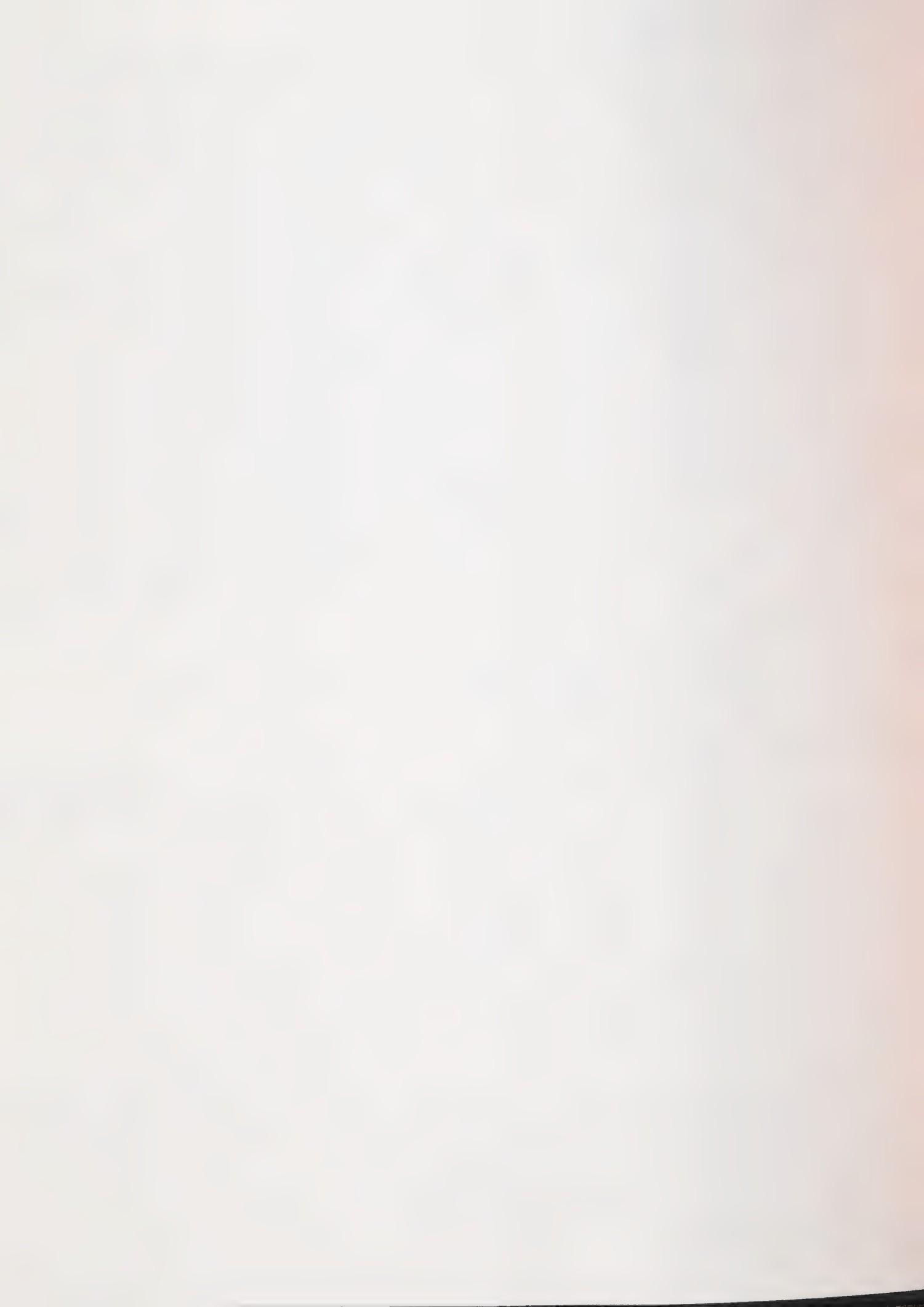
A ONE - LINE DIAGRAM
E-I NO SCALE

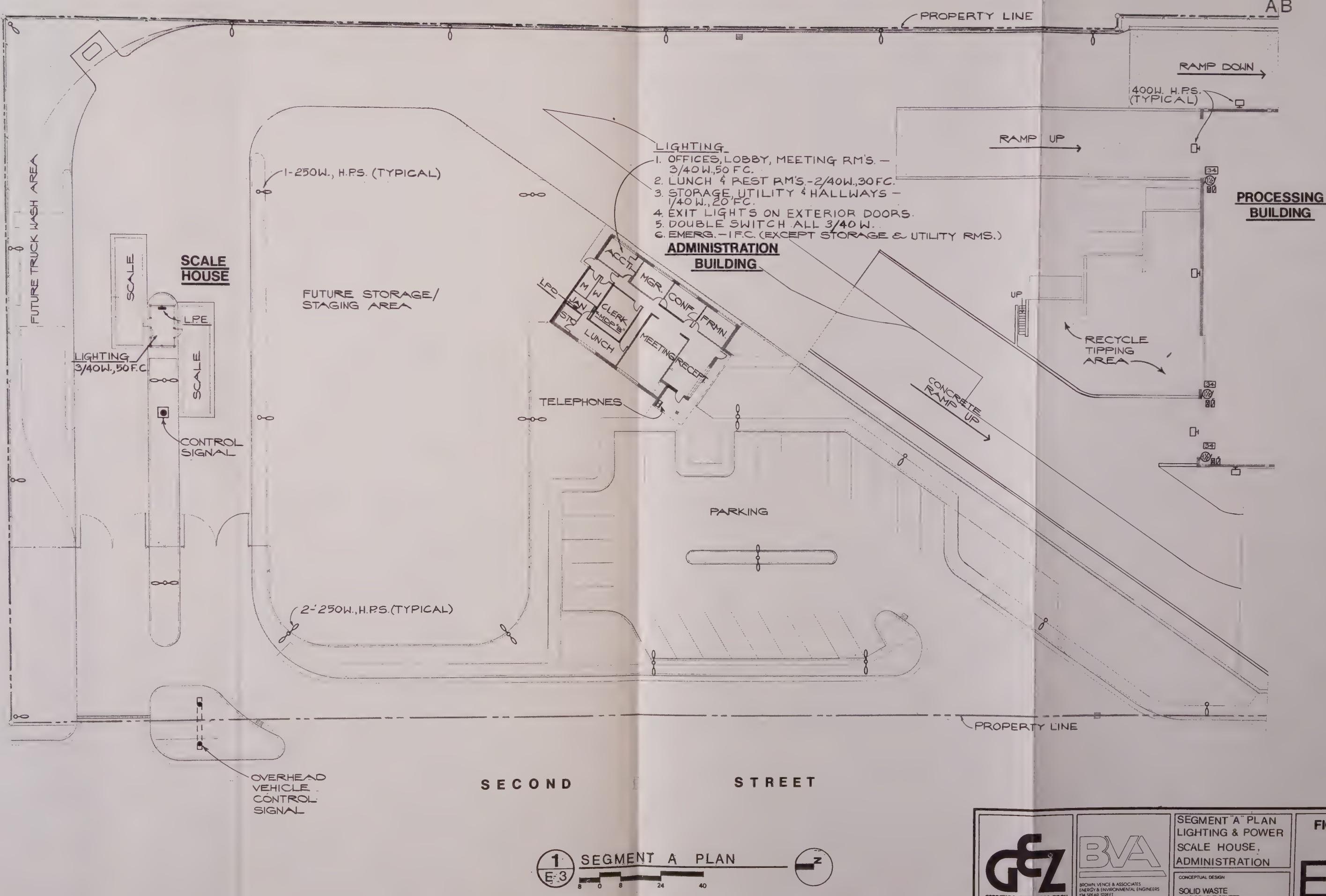




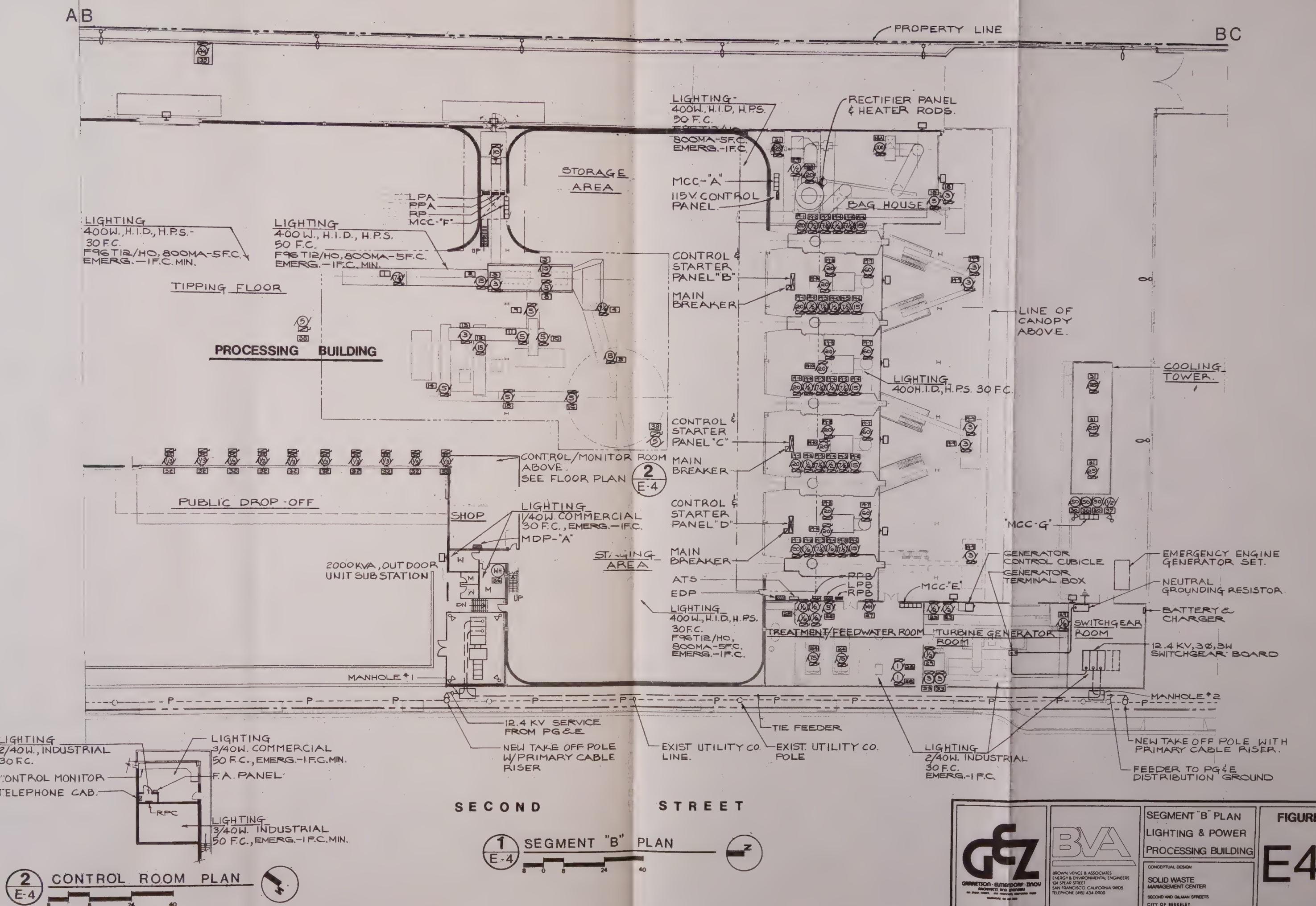
EQUIPMENT		MOTOR	LIST		
MOTOR	COMPONENT	H P	MOTOR	COMPONENT	H P
1	CONVEYOR (STEEL PAN)	7½	19-4	FUEL OIL PUMP	½
2	CONVEYOR (STEEL PAN CLEATED)	15	19-5	BURNER BLOWER (UPPER)	7½
3	ROTARY SCREEN (TROMMEL)	15	19-6	UPPER CHAMBER BLOWER	15
4	CONVEYOR (STEEL PAN CLEATED)	7½	19-7	I.D. FAN	60
5	CONVEYOR (RUBBER BELT)	5	19-8	AIR COMPRESSOR	20
6	CONVEYOR (RUBBER BELT)	5	19-9	ASH CONVEYOR	3
7	CONVEYOR (RUBBER BELT)	10	19-10	AUXILIARY BURNER BLOWER	20
8	CONVEYOR (RUBBER BELT)	5	20	FLUE GAS SCRUBBER (MOVING BED, DRY-IMPACT)	20
9	CONVEYOR (RUBBER BELT)	5	21	FLUE GAS EXHAUST FAN (MOTOR ON STAND BY, RUN BY TURBINE)	125
10	MAGNETIC SEPARATOR, 14.55 KW @ 115V D.C.	5	22	FUEL OIL STORAGE TANK	-
11	CONVEYOR (RUBBER BELT)	5	23	FUEL OIL SUPPLY PUMP	½
12	CONVEYOR-PICKING (SLIP STICK)	15	24	FEED WATER PUMP	75
13	CONVEYOR-SEPARATOR (FRICTION) STICK	3	25	CHEMICAL FEED	½
14	CONVEYOR (RUBBER BELT)	5	26	AIR COMPRESSOR	5
15	CONVEYOR (RUBBER BELT)	5	27	ELECT. WATER HEATER	125 KW
16	CONVEYOR (RUBBER BELT)	5	28	CONDENSATE PUMPS	1
17	HOPPER	-	29	SUBMERSIBLE DRAINAGE PUMP	½
18	DUST COLLECTION SYSTEM SCREW CONVEYORS	1	30	COOLING TOWER PUMP	50
18A	DUST COLLECTION SYSTEM FAN	100	31	COOLING TOWER FAN	25
19	INCINERATOR/STEAM GENERATOR (PACKAGED)	SEE ITEM 19 SERIES	32	VERTICAL DOOR	½
19-1	HYDRAULIC PUMP	20	33	CONDENSATE PUMP	3
19-2	OIL COOLER FAN	½	34	OVERHEAD DOOR	1½
19-3	LOWER CHAMBER BLOWER	7½	35	SUBMERSIBLE PUMP	¾
36	ELECTRIC WATER HEATER	45 KW	37	ASH PIT PUMP	½
38	ROOF EXHAUST FAN	5			

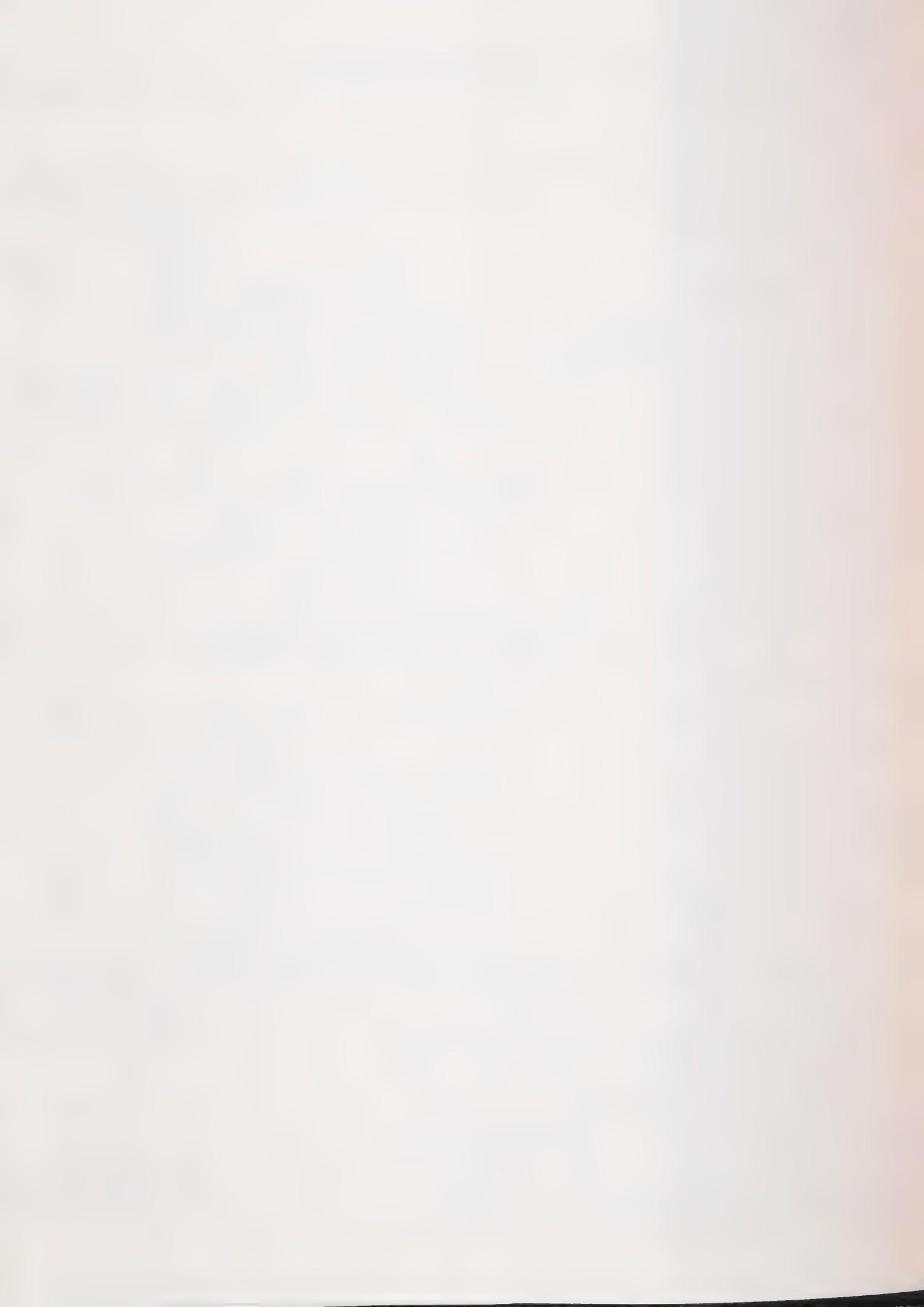












SYMBOL LIST

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>SYMBOL</u>	<u>DESCRIPTION</u>
<u>PLAN</u>	<u>DIAGRAM</u>	<u>PLAN</u>	<u>DIAGRAM</u>
— — —	UNDERGROUND PRIMARY DUCT LINE.	— (F)	FREQUENCY METER.
□	ELECTRIC MANHOLE.	— (WM)	WATTMETER.
△	OUTDOOR LIGHT ON PIPE STANCHION-150W, H.P.S.	— (KWH)	KILOWATT HOUR METER.
□	BUILDING FLOODLIGHT WITH PHOTO ELECTRIC CONTROL, 400W, H.P.S.	— (VAR)	VARMETER.
○	STREET LIGHT WITH PHOTO ELECTRIC CONTROL, 450 W, H.P.S.	— (R)	NEUTRAL GROUND REGISTER.
(5)	3 PHASE MOTOR. NO. INDICATES HORSE - POWER.	(30) (SI)	RELAY WITH DEVICE PER A.N.S.I.
■	SURFACE MOUNTED PANEL. 480V-3Φ-3OR 4 WIRE.	[19-1]	MOTOR DESIGNATION NUMBER.
□□□	MOTOR CONTROL CENTER, 480V-3Φ-3W.	— G ---	GROUND CONDUCTOR.
✉	CONTROL PANEL OR MOTOR STARTER.	○	COPPER CLAD GROUND ROD.
☒	DISCONNECT SWITCH, HEAVY DUTY TYPE.	— + —	GROUND CONDUCTOR CONNECTION.
— —	SWITCH AIR BREAK.	G	GROUND CABLE RISER.
— —	HIGH VOLTAGE PRIMARY FUSE DISCONNECT SWITCH.	--- G --- P ---	EXIST. UTILITY CO. LINE & POLE
↔(1)↔	DRAW OUT METAL CLAD SWITCHGEAR.	— G ---	TAKE OFF POLE WITH PRIMARY CABLE RISER.
↔(2)↔	CURRENT LIMITING FUSE.	A.T.S.	AUTOMATIC TRANSFER SWITCH.
— — □ —	FUSE.		
— — ~	MOLDED CASE CIRCUIT BREAKER.		
□	TRANSFORMER.		
△	DELTA TRANSF. CONNECTION.		
Y	WYE TRANSF. CONNECTION GROUNDED.		
BC	POTENTIAL TRANSFORMER.		
£	CURRENT TRANSFORMER.		
— C —	POWER FACTOR CORRECTING. CAPACITOR.		
— H —	SURGE ARRESTER		
— O —	LIGHTNING ARRESTER.		
— ▶ —	POT HEAD OR STRESS CONE.		
(RTD)	GENERATOR		
(A)	AMMETER		
(AS)	AMMETER SELECTOR SWITCH.		
(V)	VOLT METER		
(VS)	VOLT METER SELECTOR SWITCH.		
(CS)	ELECTRIC OPERATED CONTROL SWITCH.		

<u>SYMBOL</u>	<u>DESCRIPTION</u>
<u>PLAN</u>	<u>DIAGRAM</u>
— (F)	FREQUENCY METER.
— (WM)	WATTMETER.
— (KWH)	KILOWATT HOUR METER.
— (VAR)	VARMETER.
— (R)	NEUTRAL GROUND REGISTER.
(30) (SI)	RELAY WITH DEVICE PER A.N.S.I.
[19-1]	MOTOR DESIGNATION NUMBER.
— G ---	GROUND CONDUCTOR.
○	COPPER CLAD GROUND ROD.
— + —	GROUND CONDUCTOR CONNECTION.
G	GROUND CABLE RISER.
--- G --- P ---	EXIST. UTILITY CO. LINE & POLE
— G ---	TAKE OFF POLE WITH PRIMARY CABLE RISER.
A.T.S.	AUTOMATIC TRANSFER SWITCH.



SECOND STREET
SEGMENT "C" PLAN





APPENDIX J
OUTLINE SPECIFICATIONS

OUTLINE SPECIFICATIONS

FOR

CITY OF BERKELEY

SOLID WASTE MANAGEMENT CENTER

AUGUST 1980

GARRETSON·ELMENDORF·ZINOV
ARCHITECTS AND ENGINEERS
124 SPEAR STREET
SAN FRANCISCO, CALIFORNIA
TELEPHONE (415)-434-3838

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 1A - GENERAL CONDITIONS

A. SCOPE

1. The items under this section include costs which will be the direct responsibility of a General Contractor and include, but is not limited to, the following:

- a) payment bond
- b) performance bond
- c) field office with telephone
- d) temporary utility hookup
- e) secured storage area
- f) temporary toilet facilities for workers
- g) construction sign and bulletin boards
- h) site maintenance and final cleanup
- i) active safety program
- j) continuous cleanup and disposal of waste materials
- k) testing
- l) surveying as required for orientation, layout, and elevation control
- m) permits, licenses, and fees
- n) supervision, quality control and continuous inspection
- o) miscellaneous equipment rental

B. APPLICABLE PUBLICATIONS

- 1. Uniform Building Code
- 2. City of Berkeley ordinances and standards
- 3. Occupational Safety and Health Act
- 4. California State Industrial and Construction Safety Orders
- 5. Others: See under specific specification Section

C. REQUIREMENTS

- 1. Payment bond will be 100% of the contract price.
- 2. Performance bond will be 100% of the contract price.
- 3. The Contractor will maintain a field office no smaller than 8 feet by 20 feet and will employ the following minimum field staff:
 - a) Superintendent
 - b) Quality Control Engineer
 - c) Clerk-Typist
 - d) Engineering Inspector

- C.
4. The field office will be equipped with a telephone having a minimum of two (2) incoming lines, a plan rack and a layout table adequate to accommodate a full set of plans, in addition to normal office equipment related to field needs.
 5. The Contractor is responsible for temporary utility hookup, toilet facilities, and a place for workers to wash their hands and obtain drinking water.
 6. There will be a minimum of 3,000 square feet of fenced on-site storage.
 7. The Contractor will furnish and install a temporary 4' x 6' project sign giving the project name, the Contractor's name, the name of the Design Engineer, and the City of Berkeley Public Works Director.
 8. The Contractor will maintain a 3' x 5' bulletin board and conduct an active safety program.
 9. The Contractor will be responsible for maintaining a trash bin and enforce periodic cleanup of the site.
 10. The Contractor will subcontract the services of a surveyor, soils engineer and such independent testing agencies as are required by the Technical Specifications.
 11. The Contractor is responsible for obtaining all permits, licenses, and paying any fees that may be required by the City or other agencies having jurisdiction for such.
 12. The Contractor will be responsible for maintaining an inspection staff adequate in number and in qualifications to process submittals for approval and for quality control, insure conformance with the plans and specifications and to coordinate the activities of subcontractors.
 13. The Contractor is responsible for furnishing (or renting) miscellaneous equipment such as cranes, air-compressors, or other equipment necessary to support the activities of different subcontractors.

* * * * *

DIVISION 2 - SITEWORK

SECTION 2A - DEMOLITION

A. SCOPE

The work includes, but is not limited to, the following:

1. Demolition and disposal of all materials from the following Buildings (see Demolition Plan S-1 for Location):

Building No. 1	One story steel truss framing with metal siding and roof. Raised concrete loading dock and floor. South end of structure is slab on grade. Concrete foundations.
Building No. 2	One story steel structure with metal siding and roof. Concrete slab on grade and foundations.
Building No. 3	One story steel structure with metal siding and roof. Raised concrete floor and concrete foundations.
	Three story steel addition with metal siding and roof and wood floor framing.
Building No. 4	Airco Building. One story steel columns and girders with wood beams and joist. Raised concrete loading dock. Slab on grade floor with concrete footings. Concrete exterior walls and some masonry interior partitions. North end has taller processing section of steel framing with concrete walls. There is interior space of masonry walls and concrete mezzanine floor. There is processing equipment inside with tanks on west side.
	North of processing section is some concrete storage bins with high wing walls and then north of that is a massive concrete blast wall.
Building No. 5	One story metal shed.
Building No. 6	One story Soule Steel prefabricated building with steel bents, metal roof, concrete slab on grade and depressed loading dock at southend.

Building No. 7 One story concrete bunker type building.

2. Demolition and disposal of materials from various concrete pads, slabs and foundations on the site.
3. Demolition and disposal of abandoned utilities, fences, asphalt concrete paving, and any debris on site.
4. Demolition and disposal of abandoned railroad spur track, including ties and steel rail.
5. Excavation and removal of caustic lime from site and any other deleterious soils or materials.

B. EXECUTION

1. Any salvagable materials will become the property of the Contractor.
2. All materials must be removed from the site to an approved dumping site.
3. No salvaged materials may be sold directly off the site by the Contractor, but must first be removed to the Contractors off-site storage area.
4. Any holes resulting from the demolition and removal of underground obstructions that extend below finish grades are to be filled under the earthwork section of the specification.
5. Any abandoned utility lines that are at least 36 inches clear of finish grade and structurally sound may be capped and left in place.

SECTION 2B - EARTHWORK

A. SCOPE

The work includes, but is not limited to, the following items:

1. In-place scarification and recompaction of soils immediately below fill.
2. Removal and stockpiling, on site, of all topsoil suitable for later use.
3. Importation, placing and compacting of approved engineered fill materials, rock base and sand fill.
4. Backfilling of trenches and around footings and retaining walls.

B. APPLICABLE PUBLICATIONS

1. Soils Report prepared by Harding-Lawson Associates, dated May 8, 1980.
2. State of California, Department of Public works, Division of Highways, Standard Specifications.

C. MATERIALS

1. Fill: All fill material will be approved by the Soils Engineer, be nonexpansive and will have the composition and properties required by the soils report.
2. Aggregate base will conform to Section 26, State of California standard specification for Class 2 material.

D. INSTALLATION

1. All excavation will be performed to the grade contours necessary to accommodate the roads, buildings and other structures shown on the plans.
2. The Contractor will assume full responsibility for the stability of all temporary construction slopes at the site.
3. All structural fill will be compacted by mechanical means to produce a minimum of 95 percent of maximum density as determined by ASTM Test Designation D 1557-70.

SECTION 2C - SITE UTILITIES

A. SCOPE

The work includes, but is not limited to, the following:

1. All labor, materials, tools, equipment and services necessary to furnish and install the storm drainage system.
2. Work specified under other divisions:

For mechanical, electrical and communications services,
see Division 15 - Mechanical, and Division 16 - Electrical.

B. MATERIALS

1. Storm drain will be reinforced concrete pipe conforming to ASTM Designation C 76-78.

The pipe will be Class III or better.

2. Catch basins, manholes, and junction boxes will conform to City of Berkeley Standards.

C. EXECUTION

1. Storm drainage pipes and structures will be installed as required to properly drain the finished site and allow the full intended use of the site during inclement weather.
2. Installation will be in accordance with City of Berkeley Standards.

- C. 3. Pipe joints will be sealed using Portland cement and sand mortar.
- 4. Pipeline trenches will be backfilled with structural fill compacted to 95 percent of maximum density.

SECTION 2D - GENERAL SITEWORK

A. SCOPE

The work includes, but is not limited to, the following:

- 1. Asphalt concrete paving at the Parking lot, driveways, yard areas, Parking bumpers and stripping.
- 2. Street realignments, curbs, gutters, sidewalks, and driveway cuts.
- 3. Fencing.
- 4. Landscaping.

B. APPLICABLE PUBLICATIONS

- 1. Asphalt Institute: "Specification and Construction Methods For Asphalt Concrete and Other Plant-Mix Types (SS01)."

C. MATERIALS

- 1. Asphalt concrete mix will be similar to Asphalt Institute Type IV mix and will conform to City of Berkeley Standard Specifications.
- 2. Permanent fencing will consist of woven wire fabric attached to metal posts to a height of six feet. Posts will have concrete foundations and outriggers for three strands of barbed wire.
- 3. Landscape plant materials will be low water usage, varieties of California natives or species proven hearty to the climate zone typical to the North Bay Region. Deciduous or bearing plants will be kept to a minimum, and the preponderance of the selections will be similar to those used in the North Bay Region's parks or other public planting areas.

An irrigation system to support this growth will consist of area watering by spray stream heads automatically time controlled, initiated by low ground moisture content. The irrigation system and planting will be inserted into the erosion control planting of California native annual plants and grasses applied in other categories of work.

D. INSTALLATION

- 1. Street realignments, curbs, gutters, sidewalks, and property cuts will conform to City of Berkeley Standards.

E. SUBMITTALS

Complete technical data for paving, parking bumpers and fencing, shop drawing for fencing, and materials list for landscaping will be submitted for approval.

* * * * *

DIVISION 3 - CONCRETE

SECTION 3A - CAST-IN-PLACE CONCRETE

A. SCOPE

The work includes, but is not limited to, the following:

1. Design concrete mixes.
2. Furnish all labor, tools, equipment, materials, and services to place, cure and finish all cast-in-place concrete and its reinforcing steel as shown on the drawings including, but not limited to, the following:
 - a) Cast-in-place, continuous and spread, footings
 - b) Slabs on grade
 - c) Retaining walls
 - d) Curbs and gutters
 - e) Concrete walls
 - f) Concrete ramps and stairs
 - g) Precast wall panels
3. Installing cast-in miscellaneous steel as described in Division 5 - Metals.
4. Application of curing compounds or materials.
5. Application of special finishes.
6. Taking and testing concrete cylinders.

B. APPLICABLE PUBLICATIONS

1. ACI211.1-77 Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
2. ACI315-74 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
3. ACI318-77 Building Code Requirements for Reinforced Concrete.
4. ASTM A615-78 Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
5. ASTM C33-78 Specifications for Concrete Aggregates.
6. ASTM C39-72(1979) Test for Compressive Strength of Cylindrical Concrete Specimens.
7. ASTM C42-68(1974) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C94-78a Specifications for Ready-Mix Concrete.

C. MATERIALS

1. Cement will be ASTM C-150 Type I or Type II.
2. Admixtures may be used to improve workability, durability, reduce permeability, water content and shrinkage or to minimize segregation or bleeding.
Admixtures will conform to Uniform Building Code Standard 26-9 and are subject to the approval of the Engineer.
3. Aggregates will conform to ASTM C-33.
4. In the Processing Building, the concrete in the floor slabs will not contain calcium chloride as this would interfere with the use of the floor hardener.
5. Reinforcing steel will be intermediate grade deformed and will conform to the latest edition of ASTM A-615 Grade 60.
6. Armoured floor hardener will be Master Builders "Master Plate 200."

D. EXECUTION

1. The minimum strength of all concrete will be 3,000 psi.
2. All concrete will be batched, delivered and place in accordance with ACI Standard 318-77 and applicable ASTM Standards.
3. All procedures for the construction of the precast wall panels will be in accord with standard accepted practices.
4. Slabs at exterior ramps and the slab at the recycling area will have a heavy broom finish.
5. Interior slabs in the scale house and the Administration Building will have a steel trowel finish.
6. Interior slabs in the Processing Building will have a light broom finish and be surface hardened with an iron-armoured floor hardener designed for heavy industrial use.

E. TEST AND SUBMITTALS

1. The Contractor will be responsible for retaining an independent concrete testing laboratory to test the strength of concrete cylinders. Three cylinders will be made for each 30 cubic yards of concrete.
2. Location of construction joints and shrinkage control joints will be submitted for approval.

* * * * *

DIVISION 5 - METALS

SECTION 5A - STRUCTURAL STEEL

A. SCOPE

Work includes, but is not limited to, the following:

1. Furnishing and installing structural steel including:
 - a) Columns, baseplates and leveling plates
 - b) Anchor bolts
 - c) Roof framing system
 - d) Girts and bracing
 - e) Subframing for roof penetrations, door frames and windows
 - f) Crane beams and brackets
2. Structural calculations by a registered Structural Engineer for all pre-engineered systems.
3. Prime coat shop painting of structural steel and field touch-up.

B. APPLICABLE PUBLICATIONS

1. American Institute of Steel Construction

Specification for the Design, Fabrication and Erection of Structural Steel for Building.

2. American Iron and Steel Institute

Specification for the Design of Cold Formed Steel Structural Members.

3. American Welding Society

A5.1 Specification For Mild Steel Covered Arc Welding Electrodes

D1.1-75 Structural Welding Code

C. MATERIALS

1. All steel will conform to the following ASTM Standards.

A-36-77a	Mill Sections and Plates
A-572 Grade 50	Rigid Frames Of Welded Plate
A-607 Grade 55	Light Gauge Structural Members

2. Welding Electrodes will be E70XX and all welds will conform to AWS A5.1.

C. 3. Bolts will conform to the following ASTM Specification:

A-307-78	Machine Bolts
A-325-78a	High Strength Bolts

4. Steel Structural Systems:

The Contractor will furnish steel framed structural systems as shown on the plans and described below.

The buildings shown are based upon the use of modified pre-engineered structural building systems using rigid frames, light gauge secondary structural members and rod bracing at the roof and in the walls in the direction perpendicular to the axes of the rigid frames.

- a) Administration Building will be designed to withstand minimum roof live loads, wind and/or seismic loads and building dead loads as required by the Uniform Building Code.

The structural system shown consist of tapered roof beams and straight columns which form two hinged rigid frames designed to withstand the vertical loads and lateral loads parallel to the axes of the frames.

- b) Receiving/Sorting area of the Processing Building will be designed to withstand special collateral loads in addition to the minimum U.B.C. roof live loads, wind and/or seismic and building dead loads.

These additional collateral loads will be:

10 PSF Vertical dead load to account for the effect of sprinklers, mechanical and electrical systems

1500 LBS Concentrated load applied at midspan of secondary roof structurals (this concentrated load need not be considered to act simultaneously with the roof live load).

The structural system shown consists of tapered roof beams and tapered columns which form two hinged rigid frames.

The column tapers are turned to the outside of the building to provide a straight vertical inside flange flush with the interior concrete walls.

- c) Staging/Storage/Boiler/Incinerator areas of the Processing Building will be designed to withstand the same additional collateral loads as the Receiving/Sorting Area.

The structural system consists of tapered roof beams and straight columns which form two hinged rigid frames designed to withstand the vertical loads and lateral loads parallel to the axes of the frames.

- C. d) Turbine/Generator/Switchgear Building will be designed to withstand the same collateral loads as well as minimum U.B.C. load requirements.

In addition, the frames in the Turbine Room will be designed to support a 20 ton capacity top riding bridge crane. The crane beams will be supported by brackets on the columns. The Contractor will supply the crane beams.

The structural system for this building consists of tapered roof beams and straight columns which form two hinged rigid frames.

D. EXECUTION

1. Quality of work will conform to current AISC and AISI specifications.
2. Welds will be by certified welders.
3. All structural steel will be shop painted with one coat of rust-inhibiting primer.

SECTION 5B - PREFORMED METAL SIDING & ROOFING

A. SCOPE

Factory finished metal siding and roofing will be provided at Processing Building, Administration Building and Scale House, and all related matching trim.

B. MATERIALS

1. Preformed metal roof panels will be factory finished outside and inside (where exposed).

Gauge and configuration will be compatible with purlin spacing and as required for conformance with Uniform Building Code for roof loading and wind uplift; under any circumstances gauge will not be less than 26 gauge.

Panel-to-structure fasteners will be of noncorrosive metal with metal backed neoprene washers.

2. Preformed metal wall panels will be factor finished outside and inside (where exposed).

Gauge and configuration will be compatible with girt spacing and as required for conformance with Uniform Building Code for wind loading. Under any circumstances gauge will not be less than 26 gauge.

Fasteners will be low profile lock-rivets with color coordinated caps, or equivalent system.

B. 2. (Continued).

Panel lengths will be full height where possible, but in no case will be less than 20 feet (one horizontal joint).

3. Color of roof panels will be white. Color of wall panels will be as selected by Architect from manufacturer's standard range.

C. INSTALLATION

Installation will be in accordance with manufacturer's printed instructions.

D. SUBMITTALS

Complete catalogue data, shop drawings, color samples and engineering calculations and/or certified test data for Uniform Building Code conformance, as hereinbefore described, will be submitted for approval.

* * * * *

SECTION 5C - MISCELLANEOUS METAL

A. SCOPE

Furnish all labor, materials, tools, and equipment for all miscellaneous steel as shown on the plans including, but is not limited to, the following:

1. Cast-in angles, bars, plates, anchors, and anchor bolts.
2. Bolts and concrete anchors.
3. Metal railings, stairs and ladders.
4. Metal grating.
5. Sleeves cast in concrete.
6. Coordinate installation of frames and supports for electrical and mechanical work with trades involved.

B. APPLICABLE PUBLICATIONS

1. American Society For Testing and Materials

A-36-77	Structural Steel
A-53-78	Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
A-120-78	Pipe, Steel, Black and Hot-Dipped Galvanize Welded and Seamless for Ordinary Use.
A-307-78	Carbon Steel Externally and Internally Threaded Standard Fasteners.

2. National Association of Architectural Metal Association (NAAMM)

Metal Bar Grating Manual.

3. American Welding Society

Standard Code for Arc and Gas Welding in Building Construction.

C. MATERIALS

1. Structural steel shape and plates will conform to ASTM A-36.
2. Pipe will conform to ASTM A-120 and A-53 Grade B.
3. Machine bolts and anchor bolts will conform to ASTM A-307.
4. Handrails will be constructed of one and one-half inch diameter pipe. Handrails, midrail and posts will be all shop welded construction, shop-primed, and will conform to OSHA and UBC standards.

C. 5. Ladders and stairs will conform to OSHA and UBC standards, and will be all welded construction. Stair treads at platform grating areas will be steel grates welded to steel channel stringers.

D. EXECUTION

1. Fabricate and erect all work in accordance with current standards subject to any required modification by the plans and/or local codes.
2. All exposed welds will be ground smooth.
3. All steel will be given one coat of shop applied rust-inhibiting primer.

* * * * *

DIVISION 6 - WOOD AND PLASTICS

SECTION 6A - FINISH CARPENTRY

A. SCOPE

Work under this section includes the following items of millwork and finish carpentry:

1. Wood bench at locker/toilet rooms in Processing Building.
2. Wood shelves in storage room at Administration Building.
3. Bi-fold doors at storage closet in Administration Building.
4. Rod and shelf at same storage closet.
5. Interior doors at Administration Building will be 3'-0" by 7'-0" by 1-3/4 inches thick, solid core, stain grade wood veneer; with hollow metal frames. See Section 8A.

B. MATERIALS

1. Benches in locker/toilet rooms will be 2 inches by 12 inches by the length as shown on the drawings, with eased edges. Bench will be supported by 2 inch diameter pipe legs, anchor-bolted to concrete slab.
2. Wood storage shelves will be 12 inches deep by 15 tiers high, at Administration Building storage room.
4. Bi-fold doors will be 5'-0" by 7'-0" by 1-3/8 inches thick, solid core.
5. Rod and shelf will be standard closet type.

* * * * *

DIVISION 7 - THERMAL-MOISTURE

SECTION 7A - INSULATION

A. SCOPE

Work under this section includes thermal insulation at exterior walls and underside of roof structure at Administration Building, control room and Scale House.

B. MATERIALS

1. Insulation at underside of roof structure will be semi-rigid type, fiberglass with scrim face, or equivalent, R-19.
2. Insulation at exterior walls (furred) will be fiberglass friction fit batt, R-11.
3. Attachment of insulation to underside of roof structure will be with "Stik-Clips" or equivalent mechanical fastener.

SECTION 7B - FLASHING AND SHEET METAL

A. SCOPE

Work under this section includes sheet metal flashing at all roof penetrations, parapet caps, overflow scuppers, gutter construction and all related conditions where water penetration can occur and/or roof water is to be diverted/directed.

B. APPLICABLE PUBLICATIONS

Architectural Sheet Metal Standards, latest edition.

C. MATERIALS

1. All flashing will be shop broken from galvanized steel.
2. Expansion/contraction joints will be provided in accordance with above referenced publication. Joints in exposed to sight location will be butt-type with backer plate.
3. Gauges of metal will be conforming with minimum standards set forth in the above referenced publication.

D. INSTALLATION

1. All flashing and related sheet metal work will be provided in longest single lengths possible.
2. All flashsing at exposed to sight locations will be installed with concealed fasteners.

SECTION 7C - ROOF ACCESSORIES

A. SCOPE

Work under this section includes roof access hatch and ladder at Processing Building and Administration Building, and gravity vents at the Processing Building.

B. MATERIALS

1. Access hatch will be prefabricated type, aluminum construction with integral curb.
2. Roof hatch will be 2'-6" square.
3. Access ladder will be aluminum, prefabricated type.
4. Gravity vents will be galvanized steel, dome type.

SECTION 7D - MOISTURE PROTECTION

A. SCOPE

Work under this section includes moisture protection for all slabs on grade at normally occupied spaces such as Administration Building and shop; and all slabs below grade; coating and protection of all walls below grade for sumps, retaining walls, pits or other constructions.

B. MATERIALS

1. Slab vapor barrier will be scrim reinforced four mil thickness polyethylene on a sand cushion.
2. Wall protection will be Volclay Bentonite panels as manufactured by American Colloid Company.

C. INSTALLATION

1. Vapor barrier will be laid on water settled sand cushion with lapped edges in each direction. Care will be taken not to puncture the film.
2. Volclay bentonite panels will be placed on the exterior faces of concrete walls, temporarily held in place with spot adhesive, and backfilled with soil.

SECTION 7E - CAULKING AND SEALANTS

A. SCOPE

Work under this section includes caulking as required at all exterior siding, concrete walls or panels, joint conditions, roof areas, or other locations where water penetration may occur.

B. MATERIALS

1. Sealant materials will be polysulfide, butyl, or silicone, as appropriate.
2. Sealant color will be selected to match closely the color of adjacent finished surfaces.
3. Primer will be of the same manufacturer as the sealant, and will be specifically the type designed for use with the sealant and contact surfaces.

* * * * *

DIVISION 8 - DOORS AND WINDOWS

SECTION 8A - METAL DOORS AND FRAMES

A. SCOPE

Work under this section includes:

1. Hollow metal doors at all interior and all exterior man-door openings, except interior to the Administration Building.
2. Hollow metal door frames at all interior and exterior man-door locations, except frames in concrete walls, which will be structural steel channels with welded stops.
3. Hollow metal frames for interior and exterior glazed openings.

B. MATERIALS

1. All hollow metal doors will be seamless, flush face construction.
2. Exterior hollow metal doors will be construed with an incombustible fiberglass core.
3. Glazed lights will be provided where appropriate.
4. All metal doors will have a shop applied baked-on primer.
5. All hollow metal man-doors will be 3'-0" wide by 7'-0" high by 1-3/4" thick. Double door openings will be 6'-0" by 7'-0".
6. All hollow metal frames will be fully welded construction, 14 gauge cold-rolled steel, with mitered corners, and all joints ground smooth.
7. All hollow metal frames will have a shop applied baked-on primer.
8. Window frames will have a removable stop for purposes of glazing.
9. Hollow metal door frames will be mortised for hardware.

SECTION 8B - ROLL-UP DOORS

A. SCOPE

Work under this section includes metal roll-up doors at openings as indicated. See Drawings for sizes and locations.

B. MATERIALS

1. Roll-up doors will be of interlocking slat type, all steel construction, factory primed.

- B. 2. Door assemblies will be complete with jamb guides, canopy and foot piece.
3. Gauge and configuration of curtain slats will be as required for opening size to conform to Uniform Building Code wind loading.
4. Roll-up doors will be power-operated with automatic safety reverse feature, and will have manual override.
5. Roll-up doors will be provided with security locks.
6. Doors will be shop-primed for finish painting in the field.

SECTION 8C - METAL WINDOWS

A. SCOPE

Work under this section includes metal windows.

B. MATERIALS

1. Windows will be aluminum, color anodized with snap-in glazing steps.
2. Windows will be vented, awning type, complete with all operating hardware (crank operator). Window construction will be intermediate grade.
3. All exterior windows will be equipped with removable insert screens.
4. Operating window at Control Room will be full pivot type.

C. INSTALLATION

Windows will be installed into finished hollow metal framed openings, furnished and installed under Section 8A.

SECTION 8D - GLAZING

A. SCOPE

Work under this section includes glass in place at all exterior windows, interior glazed partitions, and glazed door lights.

B. APPLICABLE PUBLICATIONS

1. Federal Specifications DD-G-1403A - Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).

B. 2. Flat Glass Jobbers Association Glazing Manual, current edition.

C. MATERIALS

1. Glass at all exterior locations will be clear plate.
2. Interior glazed partitions will be either clear plate or clear wire glass, as required.
3. Door lights will be clear tempered glass, or clear wire glass at the Processing Building.

D. INSTALLATION

1. All glass will be installed in accordance with the best standard practices of the trade, using neoprene glazing gaskets, setting blocks, and all miscellaneous installation components as recommended by the glazing manufacturer.
2. All glass at hollow metal construction will be installed using continuous black neoprene glazing channels.
3. Glazing compounds, where used, will be as recommended by the glass manufacturer. Oil base compounds will not be permitted.

SECTION 8E - HARDWARE

A. SCOPE

Work under this section includes complete operating hardware for all man-door openings.

B. APPLICABLE STANDARDS

1. Labelled doors and frames will be provided with hardware which conforms to applicable NFPA and Underwriters' Laboratories label standards.

C. MATERIALS

1. Locksets and keying will be split-key construction type, with removable cores. At each lock, 6 keys will be required. Master keying will be required, compatible with existing Berkeley keying system.
2. Typical door opening hardware will include the following:
 - a. Lockset (or latch set).
 - b. Butts.
 - c. Closer.
 - d. Stop.
 - e. Kickplate.

- C. 3. Pairs of doors will be equipped with deadbolts and astragals.
- 4. Exterior doors will be fully weatherstripped.
- 5. All exterior man-doors will be equipped with panic hardware.
- 6. All toilet room doors will have push/pull hardware.
- 7. Complete bi-fold hardware, including pulls and latches, will be required at bi-fold doors.

* * * * *

DIVISION 9 - FINISHES

SECTION 9A - GYPSUM DRYWALL

A. SCOPE

1. Work under this section includes gypsum drywall construction for all interior partition work except for those partitions noted otherwise on the drawings.
2. Suspended gypsum drywall ceilings in the following locations:
 - a. Scale House
 - b. Janitor, Storage, and toilet rooms at Administration Building.
 - c. Locker/toilet rooms at Processing Building.

B. MATERIALS

1. Gypsum drywall will be 5/8" thick.
2. Partitions will be constructed of electrogalvanized 25 gauge sheet metal studs, configured to receive screw application or gypsum drywall. Compatible floor and ceiling tracks. Size of studs will be 3-5/8" minimum.
3. Horizontal bridging will be 1-1/2" cold-rolled steel channels.
4. Suspended gypsum drywall ceiling system will be comprised of galvanized wire hangers, 1-1/2" cold-rolled runner channels and 7/8" hat-shaped furring channels.
5. Acoustical insulation will be 3-1/2" thick mineral fiber.

C. INSTALLATION

1. All gypsum drywall will be screw applied to metal studs on furring channels.
2. Studs will be spaced at 24" o.c. with one row of horizontal bridging located at mid span of all partitions in excess of 10'-0" high.
3. Runner channels at suspended ceilings will be spaced at 4'-0" o.c.; furring channels will be spaced at 24" o.c.
4. All drywall joints will be taped and all surfaces will be prepared for painting, stipple texture.
5. Install full depth acoustical batt insulation in all toilet room partitions and control room partitions.

D. SUBMITTALS

Material list for all gypsum drywall components and complete catalog data will be submitted for approval.

SECTION 9B - CERAMIC TILE

A. SCOPE

Work under this section includes ceramic tile floors and wainscots in all toilet rooms.

B. APPLICABLE PUBLICATIONS

1. United States Department of Commerce Simplified Practice Recommendation R-61, Ceramic Tile for Floors and Walls.
2. Tile Council of America, Inc., Handbook for Ceramic Tile Installation.
3. United States Standard Specification A-137.1-67, Wall and Floor Tile, Ceramic.
4. American Society for Testing and Materials ASTM C150, Test for Portland Cement.

C. MATERIALS

1. Floors will be unglazed ceramic tile.
2. Wainscots will be approximately 5'-0" high and will be glazed ceramic tile.

D. INSTALLATION

1. Floor tile will be installed in accordance with Tile Council of America, Inc. Specification F112-77, Cement Mortar, Bonded. Grout will be tinted.
2. Wainscot tile will be installed in accordance with Tile Council of America, Inc., Specification W242-77, Organic Adhesive.

SECTION 9C - RESILIENT FLOORING

A. SCOPE

Work under this section includes resilient flooring and top set base in control room, Administration Building and Scale House.

B. MATERIALS

1. Resilient flooring will be vinyl asbestos 12" x 12" x 1/8" thick.

- B. 2. Top set base will be rubber or vinyl, coved, 4" high, with pre-formed exterior corners.
- 3. Mastic for installation will be as recommended by the flooring/base manufacturer.
- 4. Colors will be as selected by the Architect from manufacturer's standard range.

SECTION 9D - ACOUSTICAL TREATMENT

A. SCOPE

Work under this section includes a complete suspended acoustical ceiling system at the Processing Building Control Room, and at all rooms of the Administration Building except storage, restroom, and janitor rooms, which will have gypsum board ceilings.

B. APPLICABLE PUBLICATIONS

- 1. Acoustical Manufacturer's Association: Architectural Acoustic Materials.
- 2. American Society for Testing Materials: ASTM C-636, Ceiling Suspension Systems.
- 3. National Fire Protection Association: National Electrical Code.
- 4. Uniform Building Code: Requirements for Seismic Restraint.

C. MATERIALS

- 1. Ceiling boards will be 24' x 48" non-directional lay-in acoustical panels, Armstrong, GAF, or equal. Board will be factory-finished white, with square edges.
- 2. Grid system shall be exposed steel tees and wall angles, factory-finished white, with tees designed to rigidly lock together, with no exposed fasteners.
- 3. Main runner tees will be supported by No. 12 galvanized wire hangers.
- 4. Entire ceiling grid and hanger system will be seismically braced, including compression posts as required.

SECTION 9E - PAINTING

A. SCOPE

Work under this section includes painting of all exposed interior and exterior surfaces not factory finish painted and will include, but not limited to, the following:

1. Gypsum drywall walls and ceilings.
2. Metal doors and frames.
3. Exposed metal decking and metal structural members.
4. Exposed mechanical and electrical components
5. Paint striping at parking stalls.
6. All metal handrails and supports.
7. Stencil identification of "handicapped" and "visitors" stalls at parking areas.

B. MATERIALS

1. All paint materials will be of one manufacturer.

Grade of paint will be the best line commercial quality that the manufacturer produces.

2. All field paint work will be three coats (primer counts as one coat).
3. Surface texture of gypsum drywall will be light stipple.

C. EXECUTION

1. Mixing and tinting will be done at the factory. Only labelled, unopened containers will be delivered to the job site for application.
2. Preparation of surfaces will include cleaning, etching at galvanized surfaces, wire brushing or sandpapering, setting of nail holes, gypsum board stippling, and all other preparatory work.
3. Cleaning and touch-up work will be part of this section's responsibility.

* * * * *

DIVISION 10 - SPECIALTIES

SECTION 10A - FIRE FIGHTING DEVICES

A. SCOPE

Work under this section includes the following fire fighting devices in the indicated locations:

1. Combination fire hose rack and fire extinguisher cabinet: one (1) only, at corridor of Administration Building.
2. Fire hose cabinets: at Processing Building, in locations shown on the drawings.
3. Fire extinguisher cabinets with 10 pound multi-purpose extinguishers:
 - a. In Scale House (one only).
 - b. In Control Room of Processing Building (one only).
4. Fire extinguisher cabinets with 20 point dry chemical extinguishers:
 - a. In the Receiving/Sorting and Staging/Storage areas of Processing Building (six, scattered equally throughout space).
 - b. In Treatment-Feed Room of Processing Building (two, at north and south ends of room).
 - c. In Turbine-Generator Room (two, at north and south ends of room).
 - d. In Electrical Switchgear Room (one only, near door).

B. MATERIALS

1. All hose cabinets and all extinguisher cabinets will be by one manufacturer, Standard Fire Equipment, Division of Zurn Industries, Inc in stainless steel finishes.
2. Combination fire hose rack and fire extinguisher cabinet will be Standard No. 2050, recessed canopy type with 1-1/2 inch by 1-1/2 inch hose rack, 50 foot hose, and 10 pound ABC multi-purpose extinguisher.
3. Fire hose cabinets at Processing Building will be Standard No. 8258, surface-mounted type, with 1-1/2 inch by 1-1/2 inch hose rack, and 125 foot hose.
4. Fire extinguisher cabinets at Scale House and Control Room will be Standard No. 1250, recessed canopy type, with 10 pound ABC multi-purpose extinguisher.

- B. 5. All other fire extinguisher cabinets will be Standard No. 1258, surface-mounted canopy type, with 20 pound dry chemical extinguisher.

C. INSTALLATION

1. For connections to fire hose racks, see Division 15, Mechanical.
2. Cabinets will be installed complete, with all miscellaneous hardware, trim, handles, identification decals, and other components.

SECTION 10B - LOCKERS

A. SCOPE

Work under this section includes metal lockers at the toilet rooms in the Processing Building.

B. MATERIALS

1. Metal lockers will be single tier, 18 inches wide by 18 inches deep by 72 inches high, with 4 inch closed base and ends.
2. Finish will be baked enamel.
3. Colors will be as selected by Architect from the manufacturer's standard range of colors.
4. Sloping tops and side closures, with same finish and color as lockers, will be provided.
5. Handles with two-point latches, number plates, and miscellaneous hardware and components will be provided for each locker.

SECTION 10C - KITCHENETTE UNIT

A. SCOPE

Work under this section includes a kitchnette unit at the Employees' Lunch Room in the Administration Building.

B. MATERIALS

1. Kitchenette unit will include an oven, range, upright refrigerator, sink and drainboard, upper and lower cabinets, light fixture under upper cabinets, and all other miscellaneous components as required for a complete and operable unit. Finish will be baked enamel, color to be as selected by the Architect.

SECTION 10D - TELEPHONE ENCLOSURES

A. SCOPE

Work under this section includes telephone enclosures at exterior of Administration Building, as indicated on the drawings.

B. MATERIALS

1. Enclosure will be designed for outdoor usage, heavy gauge aluminum construction, color anodized, with stainless steel directory shelf.
2. Enclosure will be designed for flush telephone mounting, and will be equipped with recessed light fixture to illuminate instrument and plastic "Phone" sign.
3. The Enclosure will include a vandalproof attachment.

SECTION 10E - TOILET ROOM ACCESSORIES

A. SCOPE

Work under this section includes the following accessories in all toilet rooms:

1. Mirror and shelf units.
2. Combination paper towel dispenser/disposal units.
3. Toilet paper dispensers.
4. Toilet seat cover dispensers.
5. Soap dispensers.
6. Grab bar assemblies at handicapped stall units.
7. Feminine napkin dispensers and disposals (at Women's restrooms only).

B. MATERIALS

1. All accessories, insofar as practical, will be by one manufacturer.
2. All accessories will have stainless steel or chrome finish.

C. INSTALLATION

All rough opening and backup requirements will be coordinated with other trades as required to assure proper locations, reinforcing, and fit.

SECTION 10F - TOILET PARTITIONS

A. SCOPE

Work under this section includes metal toilet partitions at all toilet stalls, and metal urinal screens at all urinal stalls.

B. MATERIALS

1. Toilet partitions will be ceiling-hung and wall-braced type.
2. Urinal screens will be wall-hung, bracket-supported type.
3. Finish of all toilet partitions and urinal screens will be baked enamel.
4. Colors will be as selected by the Architect from the manufacturer's standard range of colors.

SECTION 10G - SHOWER STALLS

A. SCOPE

Work under this section includes pre-fabricated shower stall enclosures in the Locker/Toilet Rooms in the Processing Building.

B. MATERIALS

1. Shower stalls will be one-piece molded fiberglass type, 36 inches by 48 inches, with corner seat, soap dish, and integral receptor with drain.
2. Chromium-plated brass curtain rod and curtain.
3. Color of fiberglass shower stalls will be as selected by the Architect from the manufacturer's standard range.

SECTION 10H - FLAGPOLE

A. SCOPE

Work under this section includes a flagpole placed in front of the Administration Building.

B. MATERIALS

1. Flagpole will be cone-tapered aluminum, 28 feet overall length, 25 feet exposed length, dark bronze anodized finish, with wall thickness 3/15 inch minimum, butt 5 inch diameter, top 3-1/4 inch diameter.

B. 2. Accessories will be as follows:

- a. top ball, 5 inch diameter.
- b. cleats, with cleat cover.
- c. base collar.
- d. halyards, snaps, pulleys, and all fittings and miscellaneous hardware as required for complete and operable installation.

C. INSTALLATION

1. Concrete footing will be provided in accordance with Division 3 - Concrete.

SECTION 10I - SIGNAGE

A. SCOPE

Work under this section includes a permanent project sign at entrance to site, identifying sign at Administration Building; written instruction signs at Scale House, commercial and public tipping areas, and traffic signs as indicated on plans.

B. MATERIALS

1. Project sign will be a permanent construction with concrete base foundation, structural metal frame with resawn texture wood trim, metal and plastic face. Sign face will be back illuminated for night viewing.
3. Identifying sign at Administration Building will be raised metal can individual letters for the words "Solid Waste Management Center," a full can with plastic face for identifying the City of Berkeley and a wood trim to surround the entire assembly.
3. Instruction signs will be 16 gauge steel sheet, with porcelain enamel face and back. Instruction copy will be multi-color and include simplified pictorial graphic representations of permitted and prohibited activities.
4. Traffic signs will be to City of Berkeley standards and placed at the direction of the City Traffic Engineer.

C. INSTALLATION

1. Project sign concrete base will be poured in place with anchor bolts for attachment of steel frame. Metal can, plastic and metal face and wood trim will be of thickness, design and attachment to withstand both weather and vandalism.

- C. 2. Administration Building sign will be placed so as to be primarily visible travelling north on Second Street. Wood trim, metal can and plastic face will be weather- and vandalproof.
- 3. Instruction signs will be bolted to the face of Buildings at the site of major activities with approximate spacers, and backing plates

* * * * *

DIVISION 11 - EQUIPMENT

SECTION 11A - PROCESS EQUIPMENT

A. SCOPE

The work under this section includes the furnishing and installation of a mixed municipal solid waste processing line, solid waste modular combustion/waste heat boiler units, air pollution control device, dust collection system, rolling stock, and peripheral equipment as indicated on the equipment list. The processing line will consist of the following:

- Steel pan conveyors
- Steel pan cleated inclined conveyors
- Rubber belt conveyors
- Rotary screen (trommel)
- Magnetic separator
- Picking station conveyor (slip-stick)
- Storage bins

B. APPLICABLE PUBLICATIONS

1. Steel Pan and Cleated Inclined Conveyors
 - a. Rexnord Conveying Equipment Division
 - b. Mayfran Conveyor Systems
2. Rubber Belt Conveyors
 - a. Rexnord Conveying Equipment Systems
 - b. Stevens-Adamson
3. Rotary Screens (Trommel)
 - a. Triple "S" Dynamics Corp.
 - b. Gruendler
 - c. Spout Waldron
4. Magnetic Separators
 - a. Dings Magnetic Group
 - b. Eriez Magnetics
5. Picking Station Conveyor (Slipstick)
 - a. Triple "S" Dynamics

B. 6. Dust Collection

- a. Torit
- b. Mikro-Pul
- c. American Filter

7. Piping

- a. Piping will be in accordance with that specified in Division 15 - Mechanical.

8. Ductwork and Breeching

- a. Ductwork and breeching will be in accordance with that specified in Division 15 - Mechanical.

C. EQUIPMENT

Refer to Table I for a complete list of equipment covered under this division.

D. INSTALLATION

Equipment installation will be as per manufacturers or suppliers specifications and recommendations. Equipment list indicates which equipment manufacturers offer installation services. Contractor will, in either case, bear ultimate responsibility for correct installation.

E. TESTS AND SUBMITTALS

Contractor will be responsible for assuring that five (5) copies of the maintenance and operating manuals, for each piece of equipment installed, are furnished to the Owner upon completion of installation.

TABLE I - EQUIPMENT LIST

ITEM NO.	COMPONENT	TYPE	# OF UNITS	DESCRIPTION SIZE	DESIGN CAP / TPH	MAT'L DENS #/ft ³	WEIGHT (INCL. SUPPORTS) (Pounds)	OTHERS	HP
1	Conveyor	Steel Pan	1	84" w x 25' Ctrs. Horiz. Hyd. Dr. Vari-Speed 2.4 - 12 fpm Includes Receiving Hopper	60	10 - 23	38,000	*	7-1/2
2	Conveyor	Steel Pan Cleated	1	84" w x 45' Ctrs. (35' Incline (45°), then 10' Horiz) 25' Vert. Rise, Vari-Speed 7.2 - 36 fpm	60	10 - 23	57,000	*	15
3	Rotary Screen (Trommel)	Steel	1	9' Ø x 45' long 7' Feed, 15'-2" Drop Holes, 20'-4-3/4" Drop Holes, 3' Out Sections Declination 3-5°	60	10 - 23	140,000	*	30
4	Conveyor	Steel Pan Cleated	1	84" w x 18' Ctrs. Incline 5' Rise (15½°) Vari-Speed 7.2 - 36 fpm	22	4-8	31,000	*	7-1/2
5	Conveyor	Rubber Belt	1	84" w x 24' Ctrs. Incline 9' Rise (22°) 250 fpm	22	4-8	24,000	*	7-1/2
6	Conveyor	Rubber Belt	1	60" w x 12' Ctrs. Incline 1' Rise (5°) 100 fpm	22	25 - 40	14,000	*	5
7	Conveyor	Rubber Belt	1	48" x 62' Ctrs. Incline 24' Rise (23°) 150 fpm	22	25 - 40	27,500	*	15
8	Conveyor	Rubber Belt	1	60' x 12' Ctrs. Incline 1' Rise (5°) 100 fpm	16	18 - 25	14,000	*	5

TABLE I - EQUIPMENT LIST

ITEM NO.	COMPONENT	TYPE	# OF UNITS	DESCRIPTION SIZE	DESIGN CAP/TPH	MAT'L DENS #/ft ³	WEIGHT (INCL. SUPPORTS) (Pounds)	OTHERS	HP
9	Conveyor	Rubber Belt	1	60' x 25' Ctrs. Incline 4' (9°) 100 fpm	16	18 - 25	14,500	*	5
10	Ferrous Magnetic Separator	Continuous w/Steel cover	1	D'ble Pick - 48" w Vari-Speed 250-450 fpm Incl. 15 Kw Rectifier & Rotary Splitter	5	12-20	15,000 (Suspended)	Power Consumption: 14,530 Watts @ 115 V;D.C.	5
11	Conveyor	Rubber Belt	1	72" w x 30' Ctrs. Incline 8' (15½°) 100 fpm	14	10 - 20	20,000	*	5
12	Conveyor - Picking	Slip-Stick	1	Vibrating Type Slip-Stick 60" x 28" Ctrs., Horiz.	5	10 - 15	12,000	*	15
13	Conveyor - Separator	Friction Slide	1	72" w x 12' Ctrs. Incline Adjust. 0-28° Variable Speed 20 - 200 fpm	15	10 - 20	5,000	*	3
14	Conveyor	Rubber Belt	1	48" w x 28' Ctrs. Incline 4' (8°) 150 fpm	14	10 - 20	13,000	*	5
15	Conveyor	Rubber Belt	1	48" w x 24' Ctrs. Decline 5' (-12°) 150 fpm	13	10 - 20	12,800	*	5
16	Conveyor	Rubber Belt	1	48" w x 35' Ctrs. Incline 13' (22°) 250 fpm	15	10 - 20	15,000	*	5
17	Storage Hopper	Steel	1	3/8" thick steel, 40 C.Y. (10'x10'x10'), Sloped bottom (approx. 35°) w/ Swing Chute Discharge w/ Motorized Gate.	24 Tons (1HR storage)	25 - 40	12,000 Hopper 48,000 Mat. 60,000 Total	-	-

TABLE I - EQUIPMENT LIST

ITEM NO.	COMPONENT	TYPE	# OF UNITS	DESCRIPTION SIZE	DESIGN CAP	MAT'L DENS #/ft ³	WEIGHT (INCL. SUPPORTS) (Pounds)	OTHERS	HP
18	Dust Collection & Scrubber Ash Baghouse	Pulse Jet	1	2 to 1 Ratio Collection Bags; Part for Dust Collection and Part for Scrubber Fly Ash Collection. Screw Conveyors for Dust Discharge.	50,000 CFM	-	25,000	Compressed Air - 45 SCFM @ 90 - 100 PSIG	5 (Screw) 3 (Screw)
18A	Dust Collection Fan	Centrifugal Exhauster	1	9" sp, 50,000 CFM @ ambient	50,000 CFM	-	5,500	17,000# Concrete Base	100
19	Incinerator/Boiler	Packaged	4 Incin (1 Stand- by) 4 Boil- ers	Hydraulic Feeders, dual Combustion Chambers, Ash removal and conveyors, heat recovery boilers, and controls complete.	Waste @150 TPD Sup- plying 34,000 PPH Steam @ 600 Psig @550°F	9 -17	1,000,000	See design cap. for water supply. 480V Con-supply line needed. * KWH) Design Elec. for 670 HP	500 Normal Elec. Con-sump. 3750 * KWH) Design Elec. for 670 HP
20	Electro-Scrubber (Fly Ash Control)	Moving Bed Dry - Impact	1	Moving Bed, self-cleaning, electrostatic gravel scrubber	60,000 ACFM @500°F	-	252,000	500 watts @ 20 KV for Electrode. 480V Supply Line needed 110V Line for Control Panel. Compressed Air 15 CFM @ 5 psig *	20

TABLE I - EQUIPMENT LIST

ITEM NO.	COMPONENT	TYPE	# OF UNITS	DESCRIPTION SIZE	DESIGN CAP	MAT'L DENS #/ft ³	WEIGHT (INCL. SUPPORTS) (Pounds)	OTHERS	HP
21	Electro-Scrubber	Centrifugal Exhauster	1	Hot Gases Exhaust Fan 6" sp., 60,000 ACFM 500°F; Elec. Motor for startup and steam turbine for normal running.	60,000 ACFM @500°F		11,700	Steam supplied to steam turbine @ 90 HP. 36,000# concrete base	125 for Starting only
22	Fuel Oil - Storage Tank	Underground Fiberglass	3	Storage No. 2 Fuel Oil; 10'-4" Ø X 38' Long.	20,000 GALS. ea - 60,000 GALS - total	Each 5,270 Tank - 142,600 Oil 147,870 Total ea 443,610 Total of 3	5,270 Tank - 142,600 Oil 147,870 Total ea 443,610 Total of 3	Hole - 51 x 48-13' deep. deadman, pea gravel, 6" concrete on top.	
23	Storage Bin	Dock Cart	8	2yd ³ (approx 5'x5'x4'h) Manual Tipping Type.	2 yd ³	2-5	300		
24	Truck Scales	Weighbridge	2	40'x10' Scale with IWM Console & Teleprinter. Landfill relocation with installation.	50 Tons			Presently existing at Berkeley Landfill. *	
25	Axle Scale	Load-out Axle	1	Shallow (12") 9'x7' with weight display & traffic light complete.			4,500	Pit and Concrete Needed. *	
26	Axle Scale	Load-out Axle	1	Shallow (12") 9'x7' with weight display and Trip Switch for Hopper Chute Gate.			4,500	Pit and Concrete Needed. *	
27	Frontend Loader	Small	1	Small Frontend Loader with enclosed Cab, Gas Powered & Muffled.		9-20			

TABLE U - EQUIPMENT LIST

ITEM NO.	COMPONENT	TYPE	# OF UNITS	DESCRIPTION SIZE	DESIGN CAP	MAT'L DENS #/ft ³	WEIGHT (INCL. SUPPORTS) (Pounds)	OTHERS	HP
28	Frontend Loader	Medium	1	Medium Frontend Loader with Backend Tamper. Enclosed Cab, Diesel Powered & Muffled.		10-23			
29	Transfer Trailer & Tractor	Open Top, Construction Quality.	2	90 yd ³ (approx 40'x 8' x 13' h o'all) Hinged Top Panels, Top Hinged Back Door, Live Bottom. 3 axle Diesel Tractor.	90yd ³ (80,000 # max. road weight.)	10-40	20,000 Trailer 13,000 Tractor 33,000 Total		
30	Tilt Frame Truck and Hoist	Roll-off Container System	1	3 Axle Tilt Cab Type Truck, Roll-off Tilt Frame Body, 60,000# Line Pull.	22' max. con- tainer Length (49500 #max. Road Wt)	3-60	16,000 Truck 6,000 Hoist 22,000 Total		
31	Container	Roll-off	4	Nominal 30 yd ³ (approx. 20'x 8'x 6') Heavy Duty Construction (10 gauge Bottom, 12 gauge Sides) Double Hinge Back Door, with Wheels.	30yd ³	3-25	4,400		
32	Container	Roll-off	9	Nominal 20 yd ³ (approx. 20'x 8'x 4') Heavy Duty Construction (10 gauge Bottom, 12 gauge Sides) Double Hinge Back Door, with Wheels.	20yd ³	30-60	3,850		

* Equipment suppliers to provide installation and/or installation supervision.

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14A - CRANES

A. SCOPE

1. Work includes furnishing and installing a 20 ton bridge crane in the Turbine Generator Room complete with crane rails and electrical conductors.

B. APPLICABLE PUBLICATIONS

CMAA - Crane Manufacturers Association of America (Formerly Electric Overhead Crane Institute).

C. MATERIALS

1. The overhead bridge crane will be a top riding, double bridge type having the following characteristics:

Bridge -

50 ft. span
Travel - Motorized, 2 speed, 25-125 ft./min.

Trolley -

Overhead type
Travel - Motorized, 2 speed, 5-25 ft./min.

Hoist -

20 ton capacity
Lift speeds, 3 and 15 ft./min. w/inching control

Control -

Pendant type with on/off, forward/reverse for bridge and trolley, raise and lower for the hoist, and inching control.

2. Crane rails will be 40 pound and attached to continuous girders by means of "J" bolts. Crane girders are included with structural steel, Section 5A.

D. INSTALLATION

Fabrication and installation will be in accordance with CMAA Standard Specifications.

Power will be supplied under Division 16 to a disconnect switch and panel mounted on a column at the mid-distance of the crane runway.

E. TESTS

The contractor will be responsible for having a performance test conducted by an Independent Laboratory. The test will require a lifted load of 125% of the rated working load, operating all movement functions of the crane.

* * * * *

DIVISION 15 - MECHANICAL

SECTION 15A - PLUMBING

A. SCOPE

The work under this section includes, but is not limited to, the following:

1. Toilet facilities for the Administration Building including plumbing fixtures, water heater, soil, waste and vent piping, domestic cold water and insulated hot water piping.
2. Extension of sanitary sewer from 5 feet outside Administration Building to the connection with the existing City sewer in Second Street.
3. A metered water service from the existing water main in Second Street to the Administration Building with anti-siphon protected branch for irrigation system.
4. Roof drainage systems including drains, leaders and connection to the site storm drainage system.
5. Water washdown stations for the Receiving/Sorting and Staging/Storage Area including hose valves and interconnecting piping.
6. Underground floor drainage systems for the Receiving/Sorting and Staging/Storage Area, Treatment/Feed and Turbine/Generator Areas, including floor drains, collection lines vents to connection with the existing sanitary sewer in Second Street.
7. Pit drainage including pump, basin and discharge piping to the point of connection with the underground drainage piping.
8. Toilet facilities for the Processing Building, including plumbing fixtures, water heater, soil, waste and vent piping, domestic cold water and insulated hot water piping.
9. A metered water service from the existing water main in Second Street for the Receiving/Sorting and Staging/Storage Areas and Treatment/Feed and Turbine/Generator Areas including backflow prevention device and piping.
10. Water demineralizers for the boiler fill and make up including piping.
11. Stainless steel sampling sink for the Treatment/Feed Area.
12. Water heater for the Treatment/Feed Area and toilet facilities for the Control Room/Shop Area.
13. Quenching sink with cold water in the shop.
14. Plant air system with quick coupling outlets in the Shop, Receiving, Sorting and Staging /Storage Areas as shown. For air compressors, see Process Section 15D.

15. Water makeup to cooling tower and boiler feedwater system.
16. Piping specialties including thermometers, pressure gauges, relief valves, flexible connections, escutcheons, sleeves, strainers dielectric unions and other specialties required.
17. Valving as required for shutoff, control and maintenance.
18. Pipe and equipment identification.

B. APPLICABLE PUBLICATIONS

1. International Conference of Building Officials.
 - (a) Uniform Plumbing Code.
2. City of Berkeley Plumbing Code.
3. State of California:
 - (a) Industrial Safety Orders, Title 8.
 - (b) Building Standards, Title 24.

C. MATERIALS

1. Plumbing Fixtures

- (a) Water closets - vitreous china, wall hung, siphon jet with carrier, flush valve and white open front solid plastic seats less covers.
- (b) Urinals - vitreous china, wall hung, water wash with carrier and flush valve.
- (c) Lavatories - 20" x 18" enameled cast iron with single lever mixing faucet, grid strainer outlet, "P" trap and supplies and stops.
- (d) Showers - non scald mixing valve, 2.5 gpm shower head, necessary piping. Receptor and drain furnished under Section 10H.
- (e) Drinking fountains - semi-recessed, wall mounted, all stainless steel electric water cooler with 8 gph capacity and 1/4 horse-power cooling unit.
- (f) Service sink - 20" x 24" acid resistant enameled cast iron with "P" trap standard, rim guard and wall mounted mixing faucet with integral stops, vacuum breaker and hose adaptor swing spout with pail hook.
- (g) Sampling sink - 21" x 25" x 7-1/2" x 18 gauge, type 316 self rimming stainless steel counter mounted sink with mixing faucet.

- C. 1. (h) Quenching sink - free standing type 302 stainless steel sink approximately 24" x 30" x 18" deep with cold water hose bibb and valved drain.
2. Drains -
- (a) Toilet rooms - cast iron body with polished nickel strainers.
- (b) Receiving/Sorting and Staging/Storage Area - heavy duty cast iron body with secured ductile iron tractor grate and deep slotted sediment bucket.
- (c) Treatment/Feed and Turbine/Generator rooms - heavy duty cast iron body with secured ductile iron tractor grate with standing sediment bucket. Smith #2142.
3. Water Heaters, Electric shown, gas optional.
- (a) Administration Building - 30 gallons, fully insulated and jacketed, glass-lined electric storage heater with 2500 watts upper element and 2000 watt lower element wired for non-simultaneous use, ASME relief valve, 150 psig construction and dry well type elements.
- (b) Receiving/Sorting/Staging/Storage Areas - same as for Administration Building except 120 gallons and 18 Kw heating element.
- (c) Treatment/Feed Room - similar for Administration Building except 10 gallons and 1250 watt heating element.
4. Piping -
- (a) Soil, waste, vent and rainwater below grade to 5 feet outside building: Service weight cast iron soil pipe and fittings, bell and spigot type with neoprene gaskets.
- (b) Soil, waste and below grade beyond 5 feet from buildings: Extra heavy vitrified clay soil pipe and fittings, bell and spigot type with neoprene gaskets.
- (c) Soil, waste, vent and rainwater above grade: Service weight cast iron soil pipe with no-hub fittings and MG couplings.
- (d) Rainwater water below grade beyond 5 feet: Reinforced concrete pipe and fittings ASTM C-76-78.
- (e) Domestic water -
- (1) 2-1/2" and smaller below grade: Type K copper with wrought copper fittings and 50/50 solder.
- (2) 2-1/2" and smaller above grade: Same as below grade except Type L.
- (3) 3" and larger below grade: Ductile iron with cast iron fittings. Extend ductile iron up 12" above floor.
- (4) 3" and larger above grade: Standard weight, galvanized steel pipe and malleable fittings.

- C. 4. (f) Compressed Air - standard weight, black steel, ASTM A-53 with 150 lb malleable screwed fittings.
5. Insulation: Insulate all domestic hot water piping systems to meet Title 24 standards.
6. Equipment -
- (a) Hose Bibbs: 3/4" bronze.
 - (b) Shock Arrestors: Install at all plumbing fixture with flush valves and at equipment, P.D.I. approved.
 - (c) Drainage Specialties: Cleanouts, roof drains.
 - (d) Fixture Carriers: Concealed type, floor mounted.
 - (e) Backflow Preventors: Double check with vacuum breaker or reduced pressure type, as required.
 - (f) Pressure Reducing Valves: Bronze or steel.
 - (g) Trap Primers: Timed Type.
 - (h) Hot Water Circulators: Bronze fitted, inline type.
 - (i) Pit Drainage Pumps: Submersible type, all iron bronze fitted, non-clog, with integral float control and castiron basin and cover. Size and capacity as required.
 - (j) Compressed Air Quick Couplers.
 - (k) Demineralizers to condition 15 gpm of city water for boiler makeup complete with valving, piping, fill and quality monitoring.

D. INSTALLATION

After all domestic water piping system have been tested and approved they will be disinfected by personnel in the employ of a firm licensed to perform this type of work.

E. TESTING

All systems will be tested as follows:

1. Water: 150 psig hydrostatic for 4 hours.
2. Compressed Air: 150 psig pneumatic for 4 hours.
3. Sanitary, Waste and Rainwater: 10 feet head of water above highest fixture, hold for one hour.

SECTION 15B - HEATING, VENTILATING AND AIR CONDITION

A. SCOPE

The work under this section includes, but is not limited to, the following:

1. Space heating for the Scale House consisting of electric baseboard radiation.
2. A central air conditioning and heating system for the Administration Building consisting of an air cooled heat pump, air terminals, inter-connecting insulated ductwork and temperature controls. Design to comply with Title 24.
3. An air conditioning and heating system for the Control Room consisting of a single zone heat pump, air terminals, inter-connecting insulated ductwork and temperature controls. Design to comply with Title 24.
4. Toilet exhaust systems for the toilet facilities in the Administration Building consisting of roof mounted centrifugal exhaust fan, ductwork and air terminals.
5. A forced air ventilation system for the Treatment/Feed and Turbine/Generator Rooms consisting of a filtered air supply with air terminals and inter-connecting ductwork interlocked with powered roof exhausters.
6. An insulated boiler breeching from the discharge connection on the boilers to the electro scrubber and including the ducting between the scrubber and the induced draft fan and the fan discharge stack.
7. Dust collection duct system including hoods and ducts to the bag house.
8. Exhaust system for the Shop and Toilet Rooms in the Processing Building consisting of roof mounted exhaust fan, ductwork, air terminals and electric unit heaters.
9. The testing and balancing of all heating, ventilating and air conditioning systems.
10. Fire and smoke dampers where required by codes with access doors.
11. Duct specialties including flexible connection, access doors and manual balancing dampers.
12. Exhaust fans for Receiving/Sorting and Staging/Storage Areas.

B. APPLICABLE PUBLICATIONS

1. State of California:
 - (a) Building Standards Title 24.
 - (b) Industrial Safety Orders Title 8.
2. National Fire Protection Association
 - (a) Bulletin 90A - Air Conditioning and Ventilation Systems.

- B. 3. American Society of Heating, Ventilating, Refrigerating and Air Conditioning Engineers Guide (ASHRAE).
4. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
- (a) Manual for Duct Construction.

C. MATERIALS

1. Ductwork - Fabricate from galvanized sheet steel in accordance with the SMACNA Manual for Low Pressure Duct Construction, latest edition.
2. Air Terminals - Supply, return and exhaust diffusers, registers or grilles as required with performance rated by the Air Diffuser Council.
3. Flexible Duct - U.L. approved, insulated, to suit pressure requirements.
4. Filters - 30% efficient by 2" thick disposable panel type.
5. Vibration Isolation - Spring type, seismic restrained isolators for all rotating equipment not internally isolated.
6. Insulation -
 - (a) Duct - insulate all heated or cooled air ducts to meet Title 24 standards.
 - (b) Breeching - insulate with calcium silicate board type and weather-protect with aluminum outer jacket.
7. Equipment -
 - (a) Baseboard Radiation: Hydronic-electric type, capacity as required with integral temperature control.
 - (b) Heat Pumps: Self contained package, air cooled, roof mounted, capacity and performance as required, Title 24 standards, furnished with fan and temperature control.
 - (c) Exhaust fans:
 - (1) Toilet Rooms - spun aluminum, centrifugal type, roof mounted with factory furnished mounting curb. Size and capacity as required.
 - (2) Industrial Areas - roof mounted, propeller type with weather protection and back draft dampers. Size and capacity as required. Units will be thermostatically controlled with manual override and interlocked with supply unit where applicable.
 - (d) Ventilation Supply Unit: Cabinet type, centrifugal fan with filter section, integral vibration isolation, intake hood, all

C. 7. (d) Continued

weatherized for roof mounting. Size and performance as required.
Pace, Aladdin.

- (e) Unit Heater: Electric resistance type with integral propeller fan, contactors, safety devices and thermostat with manual fan switch remotely mounted.
- (f) Boiler Breeching: 12 gauge, black steel, rolled shaped and welded to form a continuous air tight joint to convey 500° F boiler flue gases.
- (g) Induced Draft Fan, Intake Duct, and Discharge Stack: Same as for Boiler Breeching.

D. TESTING

- 1. All air systems to be tested and balanced by personnel employed by an independent testing and balancing firm utilizing the procedures and report format of the Associated Air Balancing Council.

SECTION 15C - FIRE PROTECTION

A. SCOPE

The work under this section includes, but is not limited to, the following:

- 1. An automatic wet sprinkler system for the Administration Building based on light hazard conditions in accordance with N.F.P.A. Pamphlet 13 including connection to the existing water main in Second Street, Fire Department connection, valve and alarm station and piping to fire hose cabinet (furnished under Section 10A).
- 2. A hydraulically calculated automatic wet sprinkler system based on ordinary hazard conditions in accordance with N.P.F.A. Pamphlet 13 for the Processing Building and associated areas including connection to the existing water main in Second Street, Fire Department connections, valve and alarm stations, and piping to hose racks (furnished under Section 10A) where shown.
- 3. An automatic wet sprinkler system for the cooling towers.
- 4. Fire hydrants where required including connection to water mains, shut off valve and piping.

B. APPLICABLE PUBLICATIONS

- 1. National Fire Protection Association (NFPA)
 - (a) Pamphlet No. 13 - Standards for Installation of Sprinkler Systems.
 - (b) Pamphlet No. 24 - Standard for Outside Protection.
 - (c) Pamphlet No. 214 - Standards for Cooling Towers.

- B. 2. City of Berkeley Fire Regulations and Standards.
- 3. National Electric Code.
- 4. State of California
- (a) Fire code.

C. MATERIALS

- 1. General: All materials will be new and will be Underwriter's listed and labeled.
- 2. Piping -
 - (a) Sizes 3" and larger below grade: Class 250, centrifugal cast-iron water pipe and fittings, ASA A21.6 and ring gasket joints suitable for 200 psig working pressure.
 - (b) All piping above grade: Schedule 40 black steel pipe with 175 pound cast iron screwed fittings or schedule 40 black steel pipe grooved for and with Victaulic No. 77 couplings and painted fittings.
- 3. Sprinkler heads - automatic spray type: upright on exposed piping and pendent type with eschutchens for concealed pipe with furred ceilings. Temperature rating as required by N.F.P.A. Pamphlet 13.
- 4. Spare heads and cabinets as required by N.F.P.A. Pamphlet 13.
- 5. Hangers, inserts, supports and seismic bracing: provide in accordance with N.F.P.A. Pamphlet 13.

D. EQUIPMENT

- 1. Valve and alarm station: Provide in accordance with N.F.P.A. Pamphlet 13 and the City of Berkeley Fire Department.
- 2. Fire Department Connection: Standard with hose connections to meet City of Berkeley Fire Department standards.
- 3. Fire Hydrants: To conform to the City of Berkeley standards.

E. TESTS

- 1. Test all sprinkler systems in accordance with N.F.P.A. Pamphlet 13 in the presence of a representative of all authorities having jurisdiction as well as a representative of the Architect.

SECTION 15D - PROCESS

A. SCOPE

The work under this section includes, but is not limited to, the following:

- A.
1. In general, work included in this section will begin or end at the walls of the Treatment/Feed Room adjacent to the Staging/Storage and Combustion Areas. Work beyond these walls appears in other sections unless otherwise shown.
 2. Boiler feed water system including deaerators, feed water pumps, interconnecting piping and controls.
 3. A continuous blowdown system with heat recovery to preheat boiler makeup water including sampling, controls and interconnecting piping. Pipe blowdown discharge to ash pits for quenching.
 4. A condensate return system including high pressure receiver and pumps with controls and interconnecting piping.
 5. A steam turbine/generator set including steam supply, water cooled condenser, condensate pumps, interconnecting piping and controls.
 6. A cooling tower system complete with pumps, make up water, chemical treatment and piping to the water cooled condenser.
 7. An underground customer steam service with pumped return including customer condensate receiver and pumps, expansion joints, drip trap assemblies and condensate receiver with pumps and interconnecting piping.
 8. A chemical treatment system for the steam boilers including chemical tanks and pumps, monitoring devices and interconnecting piping and controls.
 9. Plant air system including instrument and control air compressors, air dryers, filters, regulators and all interconnecting piping.
 10. Cooling tower bleed recovery system for ash quenching including pump and interconnecting piping.
 11. Piping specialties including thermometers, pressure gauges, relief valves, strainers, manual air vents, escutcheons, sleeves, flow meters, dielectric unions, and other specialties required.
 12. Valving as required for shutoff, control and maintenance.
 13. Pipe and equipment identification.
 14. Fuel Storage Systems.

B. APPLICABLE PUBLICATIONS

1. International Conference of Building Officials.
 - (a) Uniform Plumbing Code.
 - (b) Uniform Mechanical Code.
 - (c) Uniform Fire Code.
2. State of California.
 - (a) Industrial Safety Orders - Title 8.

- B. 3. American Welding Society Standards.
4. American Society of Mechanical Engineers (ASME)
- (a) Pressure Piping Code.
- (b) Unfired Pressure Vessel Code.
5. National Electric Code.
- C. MATERIALS
1. Piping -
- (a) Boiler feedwater
- (1) Low Pressure: Schedule 80, black steel, ASTM A53 Type E, Grade D with extra strong seamless steel, butt weld fittings. For 1-1/4" and smaller use 175 pound screwed, black cast iron fittings.
- (2) High Pressure: Schedule 80, seamless black steel, ASTM A53 Grade B pipe with extra strong, seamless steel butt weld fittings. For 2" and smaller use 3000 pound forged steel socket weld fittings.
- (b) Steam
- (1) High Pressure (600psi/550°F): Schedule 80, seamless black steel, ASTM A 53, Grade B pipe with extra strong, seamless steel butt weld fittings. For 2" and smaller use 3000 pound forged steel socket weld fittings.
- (2) High Pressure (150psi/saturated): Schedule 40, seamless black steel, ASTM A 53 Grade B pipe with standard weight seamless black steel, butt weld fittings. For 2" and smaller use 2000 pound forged steel socket weld fittings.
- (3) Low Pressure (Turbine Exhaust): Schedule 40, black steel, ASTM A 53, Grade A pipe with standard weight seamless steel, butt weld fittings. For 2" and smaller use screwed 150 pound black malleable, banded fittings.
- (c) Condensate
- (1) 600 psi Trap Discharge: Schedule 80, seamless black steel pipe, ASTM A 53, Grade B pipe with 3000 pound forged steel socket weld fittings.
- (2) Pumped: Schedule 80, black steel pipe ASTM A 53, Grade A with extra strong seamless steel butt weld fittings. For 1-1/2" and smaller use 125 pound black cast iron screwed fittings.
- (3) All other returns and 150 psi trap discharge: Schedule 80, seamless steel ASTM A 53 Grade B with extra strong, seamless

C. 1. (c) (3) Continued:

steel, butt weld fittings. For 1-1/2" and smaller use 250 pound black cast iron screwed fittings.

- (d) Boiler Blowdown: Schedule 80, seamless black steel pipe, A 53, Grade B pipe with 3000 pound forged steel socket weld fittings.
- (e) Fuel Oil (#2 Diesel) above Grade: Schedule 40, black steel, A 53, with 3000 pound black, screwed malleable iron fittings.
- (f) Plant Air: Schedule 40 black steel, A 53 with standard butt weld fittings. For 2" and smaller use 150 pound black malleable iron screwed fittings.
- (g) Instrument & Control Air: Type L hard drawn copper tube with wrought copper fittings. Polyethylene inside raceways and control panels.
- (h) Cooling Tower Water: Schedule 40, black steel and standard weight grooved type fittings for victaulic couplings.
- (i) Miscellaneous Drains and Piping: Schedule 40, black steel with malleable fittings for hot pipes. Cold pipes same except galvanized.

2. Insulation: Thicknesses per Title 24.

- (a) Hotpipes - calcium silicate with canvas jacket.
- (b) Cold Pipes - insulate to prevent condensation.
- (c) Equipment - calcium silicate block with insulating cement, fasteners, and jacket.

3. Equipment

- (a) Feed Water Pumps: Turbine type to pump 100 gpm of 240°F water at 700 psi head, driven by a 75 horsepower electric motor.
- (b) Deaerators: Pressurized type, to maintain oxygen level less than 0.005 cc/liter. Each unit will have a capacity to handle 51,000 pounds/hour and be complete with recycle pump, supporting frame, steam and water makeup control valves, factory piped with all necessary valves and controls ready for connection in the field.
- (c) Continuous Blowdown System: With flash receiver, heat exchanger, level controls, sample cooler, flow control valves, relief valve and alarm all factory piped and wired ready for connection in the field.
- (d) Cooling Tower: A wet/dry plume abatement tower with a capacity to cool 3300 gpm of condenser water from 120°F to 85°F. Connected horsepower is 60. Concrete basin and pumping pit by others.

- (e) High Pressure Drip Recovery System: A unit complete with a 750 PSI ASME labeled receiver, 3 horsepower electric driven condensate pumps with disconnect switches, liquid level controls all necessary valves and connections, factory piped and wired and mounted on a supporting framework for connection in the field.
- (f) Turbine-Generator Set: Generator will be driven by a turbine powered ultimately by 53,300 pounds per hour of 600 psig steam at 550°F. Generator will provide the maximum electrical output based on the following conditions:
 - (1) Turbine to have an uncontrolled extraction of 12,000 pounds per hour of 175 psig steam.
 - (2) Turbine to have no extraction over weekends.
 - (3) The immediate steam available will be 40,000 pounds per hour.

Turbine, generator, gear box and lubrication system to be mounted on a common rigid base. Turbine - control panel to be remote in the same space. Generator control cubical will be located near the turbine control panel and will be furnished under Division 16, all components for the Turbine Generator system, both electrical and mechanical will be compatible.

- (g) Condenser: Shell and tube type with capacity to condense 53,300 pounds per hour of steam @ 4 inches of Mercury using 3,400 gpm water entering at 85° F. and leaving at 120° F. Unit to be provided with all necessary connections and support saddles.
- (h) Condensate Pumps: Base mounted, and suction, centrifugal, low NPSH pumps driven by 3 HP motor and delivering 100 gpm of 240° F. water at 60 ft. head.
- (i) Air Compressor: Dual oil free air cooled compressors each having a capacity of 45 SCFM at 125 psig mounted on a 120 gallon ASME labeled receiver. Each compressor driven by 15 horsepower motor. Unit provided complete with all controls, drains and safety devices and refrigerated dryer.
- (j) Chemical Treatment -
 - (1) Boiler Water: System complete including chemical drums, agitators, feed pumps, blowdown monitors and all piping and valves.
 - (2) Tower Water: Same as for boiler water except with analyzer controller in lieu of blowdown monitors.
- (k) Cooling Tower Pumps: Vertical turbine type with a capacity of 1,700 gpm at 80 ft head driven by 50 horsepower motor.

- (1) Ash Pit Water Pump: Vertical column centrifugal sump pump with basin cover plate and 3/4 horsepower manually controlled motor. Capacity 40 gpm at 20 ft head.
 - (m) Miscellaneous -
 - (1) High pressure steam valves:
 - a. 600 psi cast steel (600 psi steam)
 - b. 150 psi cast steel (150 psi steam)
 - (2) Steam pressure regulating station for 12,000 lbs per hour.
 - (n) Instrument & Control Air: Connect to plant air system and includes refrigerated dryer, filters, regulators, gages and piping.
4. Customer Steam Service
- (a) Underground direct burial conduit complete with steam, pumped condensate return and drip trap return piping, insulation and cathodic protection.
 - (b) Condensate Return Unit: Vented receiver (120 gallon capacity) with return pumps rated at 50 gpm and 75 ft. head driven by 3 horsepower motors all mounted on a common framework, factory piped and wired for field connection. (Customer end).
 - (c) Condensate Return Unit: Vented receiver (15 gallon capacity) with return pumps (duplex) rated at 6 gpm and 20 psi discharge head each and driven by a 1/2 horsepower motor.
 - (d) Expansion Joint: Slide tube, gun packed type.

D. TESTS

1. Operate all equipment and make all necessary adjustments to prove performance.
2. All piping systems will be tested as follows:
 - (a) High pressure steam and condensate, blowdown and boiler feedwater: Test hydrostatically at 150% of working pressure for 2 hours with a maximum pressure loss of 3 psi.
 - (b) Low pressure steam and all other water and condensate: Test hydrostatically at 150 psi for 4 hours.
 - (c) Fuel Oil: Test pneumatically at 50 psi for 4 hours with 0 psi pressure loss.
 - (d) Plant Air: Test pneumatically at 175 psi for 4 hours with a maximum pressure loss of 2 psi.

* * * * *

DIVISION 16 - ELECTRICAL

SECTION 16A - EXTERIOR ELECTRICAL WORK

A. SCOPE

The work under this section includes, but is not limited to, the following:

1. Primary electrical distribution system consisting of the following:
 - a. 12.4 KV primary take-off pole with a fused disconnect load break switch and lightning arrester for primary underground cable service to a 2000 KVA unit substation.
 - b. 12.4 KV primary take-off pole with a fused disconnect load break switch and lightning arrester for primary underground cable tie to Turbine-Generator Set main circuit breaker.
 - c. 12.4 KV primary cable system in underground ducts and manholes for unit substation service, generator tie feeder to existing Utility Co. grid system, and tie feeder between generator bus and unit substation.
2. Secondary 480 volt electrical distribution system consisting of underground cable services for the Administration Building, Scale House, Processing Building, Cooling Tower MCC Peripheral and Parking Area Lighting.
3. Exterior lighting system consisting of the following:
 - a. Fence perimeter and parking area lighting utilizing 250 watt high pressure sodium luminaires with integral photo-electric control, mounted on 30 foot aluminum pole. 0.5 F.C. illumination level will be provided for fence perimeter lighting and 1.0 F.C. illumination level will be provided for the parking area lighting.
 - b. Building service area lighting utilizing 400 watt high pressure sodium floodlights mounted on building exterior walls. Level of illumination will be 5.0 F.C.
 - c. Cooling tower and substation lighting at 15 F.C. illumination level utilizing 150 watt HPS stanchion-mounted luminaries.
4. Empty underground conduit for telephone to be run in the same trench with underground power conduits.
5. 2000 KVA outdoor unit substation, mounted on concrete pad and consisting of incoming primary line section with provisions for Utility Co. primary metering C.T.'s, P.T.'s and watt-hour meter, primary line selector switch section with Kirk-Key interlocks, transformer primary load-break fused disconnect switch section, 2000 KVA liquid-cooled (Silicone or R Temp) transformer section, secondary metering and main breaker section and secondary low voltage switch gear sections with drawout type air circuit breakers for outgoing feeders.
6. 500 KW emergency diesel engine-generator set, mounted on concrete pad, automatic start, in an outdoor weather-proof enclosure, with batteries, fuel tank, cooling radiator and main circuit breaker mounted on the unit.

7. Grounding system consisting of the following with maximum resistance values to solid earth ground as indicated:
 - a. Grounding for unit substation and switching station on primary distribution system
3 ohms
 - b. Grounding of metal enclosures of electrical and electrically operated equipment and cable sheaths of connecting cables
3 ohms
 - c. Grounding of secondary system neutral, lightning arresters and lighting pole standards.
10 ohms
 8. New 12.4 KV primary underground cable in new duct line and manholes to replace existing primary overhead line feeder to be removed. Removal of an existing transformer bank on pole with related primary and secondary lines.
 9. Underground cables and conduits for CCTV and communication system between Processing Building control room, Scale House and Administration Building.

B. APPLICABLE PUBLICATIONS

1. American National Standards Institute, Inc.:
 - C6.1 Terminal Markings for Electrical Apparatus
 - C12 Electricity Metering, Code for
 - C29.1 to C29.9 Wet Process Porcelain Insulators and Test Methods
 - C57.12.00 Distribution, Power, and Regulating Transformers and Shunt Reactors, General Requirement For
 - C57.12.10 Transformers, 67,000 Volts and Below
 - C57.12.70 Terminal Marking and Connections for Distribution and Power Transformers
 - C57.13 Instrument Transformers, Requirements, Terminology, and Test Code for
 - 05.1 Wood Poles, Specifications and Dimension for
 - Z35.1 Industrial Accident Prevention Signs.
 2. American Society for Testing and Materials Specifications:
 - D1351 Polyethylene - Insulated Wire and Cable
 - B8 Bare Copper Stranded Wire

3. Institute of Electrical and Electronic Engineers Standards
48 Potheads (including Test Code)

4. Insulated Power Cable Engineers Association Standards:

S-61-402 Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-68-516 EPR insulated cable, ethylene propylene

S-19-81 Type Elastomer, Single Conductor, Shielded for 15,000 Volt.

5. National Electrical Manufacturers Association Standards:

AB-1 Molded Case Circuit Breakers

FU-1 Low Voltage Cartridge Fuses

IS-4 Terminal Blocks, Industrial Controls and Systems

SG-1 Electrical Power Connectors

SG-2 High Voltage Fuses

SG-6 Power Switching Equipment

TC-1 Plastic Ducts and Duct Fittings for Underground Installations

TC-3 PVC Fittings for Use with Rigid PVC Conduit and Tubing

ST 1-4 Specialty Transformers

TR-1 Transformers, Regulators and Reactors

210 to 213 Secondary Unit Substations

6. Underwriters' Laboratories, Inc.:

Electrical Construction Materials List - Latest Publication

C. MATERIALS

1. PVC conduit, Schedule 40 - Concrete-encased duct banks.
 2. PVC Conduit, Schedule 80 - Pole risers, underground direct-burial, and under concrete floor slabs and concrete pads.

3. Wire and Cables, copper, 600 Volts and Below:
 - a. NEC standard type THHN in dry locations and THWN in wet locations.
 - b. Branch circuit conductors will be No. 12 AWG copper wire minimum.
 - c. Type AVB, TA or SIS - Switchboard wiring.
4. Bare Copper Wire - Primary overhead line and grounding system.
5. High Voltage Cables, 15,000 Volts Type EPR - Primary underground system.
6. 2,000 KVA, Outdoor Unit Substation - Rating, arrangement and location as shown on the drawings. Busses will be copper.
7. Lightning Arrester, 15 KV, distribution type - Primary underground take-off poles.
8. Pole Top Air-Break Switch, 3P, 400A, 15KV, gang-operated - Primary underground take-off poles.
9. Primary Fused Cut-out, 400A with CLF fuses, 15KV, outdoor type - Primary underground take-off poles.
10. Primary Cable Termination, with stress relief cones for type EPR solid insulation cable 15KV, indoor or outdoor type as required - Primary underground take-off poles, unit substation and generator switchgear.
11. Splicing Kits, 15KV for Type EPR Cables, with fire-proofing kit - Electric underground manholes.
12. Copper-clad steel ground rods - Grounding system.
13. 250W HPS Luminaire with 30 foot aluminum pole - Lighting for perimeter fence and parking areas.
14. 400W HPS Floodlight - Building service area lighting.

D. INSTALLATION

The installations will comply with all the mandatory, advisory, and recommended applicable rules of the following:

1. National Electrical Code.
2. National Electrical Safety Code.
3. State of California, P.U.C., G.O. No. 95.
4. City of Berkeley - Electrical and Safety Code as applicable.

E. TEST and SUBMITTALS

1. Inspection and acceptance tests will be performed on equipment and systems. The Contractor will engage the services of a recognized independent testing laboratory for the purpose of performing inspections and tests as herein specified. Inspection and test procedures will comply with the applicable requirements of "Acceptance Testing Specifications for Electrical Power Distribution Equipment & Systems" latest edition, published by the National Electrical Testing Association, Inc. (NETA). The systems and equip. to be tested will include the following:
 - a. Unit Substation, to include transformer, switchgear assembly, bus, air switches, circuit breakers, protective relays, instrument transformers, metering and instrumentation, ground fault system, and surge arrestors.
 - b. Power Cables, 15 KV and below.
 - c. Power and Lighting Cables, 600 volt and below.
 - d. Grounding System.
 - e. Power and Lighting Systems operational tests.
 - f. Emergency engine-generator set.

16B - INTERIOR ELECTRICAL WORK

A. SCOPE

The work under this section includes, but is not limited to the following:

1. Lighting System:

a. Processing Building

Receiving/Sorting Area - 30 F.C. general, 50 F.C. at task (Conveyor and trommel lines) and 5 F.C. supplementary lighting. Use 277 V, 400 W HPS, medium bay luminaires for general and task lighting and 800 m.a. F96T12/HO for supplementary lighting.

Staging/Storage Area - 30 F.C. general and 5 F.C. supplementary lighting. Use 277 V, 400 W HPS, low bay luminaires for general and 800 m.a. F96T12/HO for supplementary lighting.

Combustion/Boiler Room - 30 F.C. general 50 F.C. at task (MCC, control & instrumentation panels) and 5 F.C. supplementary lighting. Use 277 V, 400 W HPS, low bay luminaires for general and 800 m.a. F96T12/HO for supplementary lighting.

Treat/Feed Room, Turbine/Generator Room, & Switchgear Room - 30 F.C. Use 277 V, 2/40 W industrial fluorescent fixture.

Control/Monitor Room & Shop - 50 F.C., use 3/40 W commercial & industrial (shop) fluorescent fixture.

Rest Rooms- 30 F.C. Use 1/40 W enclosed commercial type fluorescent fixture.

Stairways & Utility Closet - 20 F.C. Use 1/40 W industrial

fluorescent fixture.

"Exit" lights with down light will be installed on all personnel doors for egress, with emergency power.

b. Administration Building

Offices & Lobby - 50 F.C., Use 3/40 W commercial type fluorescent fixtures, double-switching.

Restrooms - 30 F.C., Use 2/40 W commercial type fluorescent fixtures.

Storage, Utility & Hallways - 20 F.C. use industrial & commercial type (hallways), 1/40 W fluorescent fixture.

Exit lights with down light will be installed on all personnel doors for egress, with emergency power.

c. Scale House - 50 F.C., Use 3/40 W commercial type fluorescent fixture, double switching.

d. Emergency lighting system in all areas, except in closets and storage spaces in Processing Building, Administration Building and Scale House.

e. Lighting panels and lighting branch circuit wiring.

f. Lighting control and devices.

2. Receptacle System -

a. 115 V convenience outlets at Processing Building, Administration Building, Scale House, Substation Pad and Cooling Tower Pad.

b. 480 V weld outlets in Receiving/Sorting Area at the conveyor equipment, Combustion/Boiler Room, Shop, and Treat/Feed Room.

c. Clock wall outlets in Control/Monitor Room, Shop, Turbine/Generator Room, Combustion/Boiler Room, Offices & Lunch Room of the Administration Building, and Scale House.

d. GFI receptacles in restrooms, wet areas and exterior locations.

e. Branch wiring to outlets.

3. Power System Low Voltage -

a. 480 V feeders to motor control centers, Combustion/boiler control panels, and distribution panel will be copper conductor cables in steel conduit run, exposed.

b. 480 V feeder to 277 V lighting and 120 V receptacle panels will be copper conductor cables in steel conduit run, exposed.

c. Branch circuit wiring to motors will be copper conductors in steel conduit run, exposed. A separate ground conductor will be

installed in the same conduit with phase conductors.

- d. Motor control centers for conveyor & trommel equipment, dry scrubber equipment, combustion/boiler accessories, treat & feed pump equipment, turbine-generator auxiliaries and cooling tower pumps and fans. Motor control center will be NEMA I, gasketed NEMA 12 construction, Class I, Type B wiring; with main disconnect switch and combination circuit breaker and starter units as required. Motors 100 HP and above will have reduced voltage starters. Elapsed time meters will be provided for each motor.
- e. Capacitors for power factor correction will be provided for each motor of ten horsepower or larger, and will be switched with the motor.
- f. Safety disconnecting means for each motor as required by Art. 430-H of the National Electrical Code.
- g. Power wiring to Processing Building exterior overhead doors.

4. Power System - Medium Voltage:

- a. Generator control cubicle for voltage and frequency control and remote operation of the main circuit breaker. The control system will be compatible with the turbine generator set to be furnished under Division 15.
- b. Medium voltage switchgear for controlling the generated power and feeding into the P.G.&E. system and/or the unit substation. Complete with protective relays and metering.
- c. Neutral grounding resistor for grounding the generator neutral through low resistance.
- d. Battery unit and charger for D.C. electrical operation of the switchgear.
- e. 15 KV feeders from generator to the switchgear, neutral resistor and from switchgear to the unit substation.
- f. Control wiring in conduit.
- g. Surge capacitors at the generator terminals.

5. Emergency Power System

Emergency power system to provide standby power for Boiler controls, flue gas exhaust fan, feed pump, air compressor and emergency lighting, consisting of automatic transfer switch, emergency distribution and lighting panels, feeders and branch circuit wiring.

6. Process Graphic Control Board at Control/Monitor Room -
The following control function, interlocks, drives, alarms, and status indication will be monitored on the graphic control & mimic board at the Control/Monitor Room:

16B 6. a. Equipment at Receiving/Sorting Area:

Status of each motor

Conveyor speed/motion sensor

Monitor speed of Trommel Cell belt (D.C.) variable speed

Monitor speed of Trommel rubber belt (D.C.) variable speed
Magnet on/off.

Feed/no-feed light system

Conveyors & Trommel no-speed & over-speed alarms, (Magnet feed conveyor motor overtorque alarm, apron conveyor rubber belt, drop out conveyors no.1 & no. 2 rubber belt over-speed alarms.)

b. Equipment at Combustion/Boiler Room:

Primary & secondary temperatures

Feed water flow

Flue & stack gas temperatures

Alarms on primary chamber over temperature, steam temperature & pressure alarms, stack & flue temperature alarms

Alarms on auxiliary oil flow failure, boiler low water

Common signal alarm for Combustion unit motor failure

c. Auxiliary fuel tank level indication.

d. Generator output indication with recorder.

e. Steam output to client (pressure & flow rate) with recorder.

7. CCTV and Inter-com System -

CCTV digital control and inter-com system between Processing Building control room, Scale House and plant foreman office in the Administrative Building will consist of the following:

<u>Components</u>	<u>Location</u>
CCTV Video Monitor	(1) Control Room, (1) Admin. Bldg. (1) Scale House
CCTV Video Camera	(1) Scale House, (1) Receiving/Sorting Area
CCTV Video Decoder	(1) Control Room
CCTV Control Signals Encoder	(1) Control Room
CCTV Control Signals Decoder	(1) Control Room

Intercom Control Encoder & Decoder, Microphone & Handset, Speaker	(1) Control Room
Intercom Call-in Stations (Speaker/Microphone Comb.)	(1) Scale House
	(1) Receiving/Sorting Area
	(1) Scale House
	(1) Combustion/Boiler Room
	(1) Turbine/Generator Room

Transmission will be by triaxial and coaxial cables for video system, twisted pair and control wires for CCTV control signals, and twisted pair for intercom system.

8. Fire Alarm System

Fire alarm system for Processing Building will consist of the following components:

- a. Control Panel for automatic fire and smoke detection for a non-coded, electrically-supervised system for local evacuation with provision for connection to outside Fire Department Central Station.
- b. Emergency power supply to provide emergency power for a period of 60 minutes minimum.
- c. Alarm horns.
- d. Manual Stations.
- e. Connection to sprinkler flow switch.

9. Gas Alarm System

Carbon monoxide gas alarm system in the Processing Building will be provided to detect and monitor gas level in the area and at a pre-determined level will activate visual and audible alarms, and operate the Processing Building roof exhaust fans. The gas alarm panel will be located in Control/Monitor Room.

10. Security Alarm System

Security Alarm System for the secured storage areas in the Administration Building will be provided. The system will consist of electric door switches, an annunciator panel, power supply, alarm horn, flasher lights, housed in a common wall-mounted enclosure. The panel will be located in the Reception Room.

B. APPLICABLE PUBLICATIONS

1. American National Standards Institute, Inc.:

- C37.04 A.C. Power Circuit Breaker Rating Structure
- C37.06 Preferred Ratings of Power Circuit Breakers
- C37.07 Interrupting Factors - Reclosing Service

- C37.09 Test Procedures for Power Circuit Breakers
- C37.010 Application Guide for Power Circuit Breakers
- C37.11 Power Circuit Breaker Control Requirements
- C37.20 Switchgear Assemblies and Metal-Enclosed Bus
- C37.100 Definitions of Power Switchgear
- C6.1 Terminal Marking and Electrical Apparatus
- C12 Electricity Metering Code
- C57.13 Instrument Transformers Requirements Terminology and Test-codes
2. National Electrical Manufacturers Association Standards:
- SG-1 Electric Power Connections
- SG-4 Power Circuit Breakers
- SG-5 Power Switchgear Assemblies
- SG-6 Power Switching Equipment
- AB-1 Molded Case Circuit Breakers
- FU-1 Low Voltage Cartridge Fuses
- IS-4 Terminal Blocks, Industrial Controls and Systems
3. Insulated Power Cable Engineers Association Standards:
- P-46-426 Current Ratings for Cables - applicable to 15 KV shielded
- S-68-516 Electrical and Physical Requirements - 15 KV EPR Cables
- S-56-434 Polyethylene - Insulated Thermoplastic Jacketed Communication Cable
- S-61-402 Termoplastic - Insulated Wire and Cable for Transmission and Distribution of Electrical Energy
4. National Fire Protection Association:
- 1978 National Electrical Code
- 72B Auxiliary Protective Signaling Systems for Fire Alarm Service
5. State of California:
- Title 24 State Building Standards, Part 3 Basic Electrical Regulations, titled "State Building Standards Electrical Code"
6. Underwriters' Laboratories:
- Latest Publication - Electrical Construction Material List

7. U.S. Department of Commerce:

H30 National Electrical Safety Code

8. U.S. Department of Labor:

Latest Publication - Occupational Safety and Health Standards

C. MATERIALS

1. Raceway System:

- a. Rigid steel conduit, sherardized, or galvanized, or intermediate steel conduit, U.L. approved.
- b. Electrical metallic tubing maybe used for exposed indoor runs or concealed in partitions or furred ceilings.
- c. Liquid-tight flexible conduit will be used for connections to motors.
- d. Pull-boxes and wireways will be code-gauge zinc-coated or galvanized steel, size per National Electrical Code.

2. Wire and Cable (600 Volts and Below):

- a. 600 volt class, NEC standard THHN in dry locations and THWN in wet locations for power feeder and branch wiring.
- b. Type MTW, Class B stranded for control wiring.
- c. Branch circuit conductors will not be smaller than No. 12 AWG copper wire. Conductors for signals and pilot-control circuits may be No. 14 AWG copper.

3. Communication, alarm system, CCTV wire and cables:

- a. No. 18 twisted pair for communication.
- b. No. 14 AWG, type TW, 600 V class, NEC standard for fire and evacuation alarm.
- c. Cable and wire for CCTV system will be coaxial, triaxial and twisted pair conductors as recommended by the equipment manufacturer.

4. Ground Conductors will be bare copper stranded or thermoplastic insulated with green color insulation.

5. Wiring devices:

- a. Switches - 20 amperes at 120/277 volts AC., single or 3-way Weatherproof where located outdoors.
- b. Receptacles -
 - (1) Convenience outlets - Duplex, 15A, 125V, 2P-3W, grounding type.
 - (2) Clock Outlet - Single, 15A, 125V, 2P-3W, recessed with device plate.
 - (3) Weld Outlet - Single, 60A, 600V, 3P-4W, with plug, back box and adaptor plate.

- 16B 5. c. Wall Plates - Stainless steel in process areas and bakelite in finished areas.

6. Lighting Fixtures:

The type of fixtures and point of use are indicated in "A SCOPE".

7. Distribution Panel boards will be convertible type, Type CDP, 480Y/277 V, 3 phase, 4 wire, with circuit breakers as required. Busses will be copper.
8. Branch Circuit Panel boards for lighting and receptacles will be circuit breaker type, 480Y/277 V or 208Y/120 V, 3 phase, 4 wire as required. Busses will be copper.
9. Motor Control Centers will be free-standing, dead-front in NEMA 12, dust-tight and drip-tight, industrial use enclosure, Class I type B wiring, 480 volts, 3 phase, 3 wire, with main disconnect 600 A horizontal bus, 300 A vertical bus, 42,000A symmetrical bracing. Units will contain combination circuit breaker and starter units, circuit breakers, control and indicating devices. Motor control center for the cooling tower will be outdoor type, NEMA 3R. All busses will be copper.
10. Telephone cabinet will be constructed with interior dimension as indicated. Door will be fitted welded hinges and padlockable vault handle. Cabinet will be provided with 5/8 inch thick exterior grade plywood backboard with two coats of insulating varnish.
11. Safety switches and fuses will be heavy duty type, fusible or non-fusible as indicated. Fuses shall be renewable, super lag type.
12. Power System - Medium Voltage.

Medium Voltage Switchgear for Turbine Generator:

a. General -

The indoor metalclad switchgear in NEMA I enclosure is intended for use on 12.4 KV 3-phase, 3 wire, 60 Hertz system. The switchgear will be rated 15 KV and have horizontal drawout circuit breakers. The switchgear will have an impulse rating of 95KV. All busses will be copper.

The switchgear will be designated, tested and assembled in accordance with the latest applicable standards of ANSI and NEMA.

- b. The switchgear will consist of three (3) breaker units completely metal enclosed self supporting and having metal barriers forming separate compartments for circuit breaker, main bus, instruments, cables and auxiliary devices for each breaker unit.

The main bus will be rated for 1200 Amps and insulated for full length.

The circuit breakers will be rated 15 KV at 60 Hertz having a continuous current rating of 1200 Amps and are interrupting

16B 12. b. (Continued)

rating of 500 MVA. All breakers shall be interchangeable.

- c. The circuit breakers will be operated by means of a stored energy mechanism which will be normally charged by a D.C. battery operated motor and can also be manually charged with a handle.

The secondary control circuits will be of plug in design such that all control terminals are up front and completely accessible when breaker is installed in its compartment.

Circuit breakers will be provided with locking handles and Kirk Key interlocking as required.

- d. The main circuit breaker for the generator control will be furnished with:

- (1) One (1) set potential transformers, draw-out type with current limiting primary fuses and low voltage secondary fuses for metering.
- (2) One (1) set current transformers as required for metering and relaying.
- (3) Two (2) sets current transformers as required for Differential Relaying. Other set on the generator to be mounted at the generator terminals. The two sets will be matched.
- (4) Relays - Time Over Currents with voltage restraint, Reverse Power Relays, Lock out Relay, Differential Relay and Ground Fault Relay.

The ground fault relay will be wired to the current transformer mounted on the neutral in the grounding resistor cubicle.

- (5) Trip switch and breaker close switch in breaker test position. Red and green indicating lights.

- e. The feeder circuit breaker for power feed into the Utility Grid System will be furnished with:

- (1) One (1) set potential transformers draw out type with current limiting primary fuses and low voltage secondary fuses for metering and synchronized relay. The synchronizing relay will be mounted on the generator control cubicle located in the turbine-generator room.
- (2) Over and under voltage and over and under frequency relays to trip the breaker when inequality occurs in the voltage and/or frequency between the two systems. This will conform with Utility Company's requirement.
- (3) One (1) set current transformers for metering.

(4) Ammeter with selector switch - voltmeter with selector switch. Metering for KWH, maximum demand and reactive power including means to read and record periodic KWH output as required by the Utility Company.

(5) Indicating lights.

f. Tie feeder for the feed to unit substation will be furnished with:

(1) One (1) set current transformers for metering and protection.

(2) Ammeter with selector switch. KWH and reactive power meter.

(3) Time overcurrent and ground fault relays.

(4) Red and green tie breaker position indicating lights.

13. Generator Control Cubicle

a. The generator control cubicle will be metal enclosed, NEMA I enclosure and furnished with metering and controls as follows:

(1) Ammeter with selector switch

(2) Voltmeter with selector switch

(3) Power factor meter

(4) KWH and KW meters

(5) Frequency meter

(6) Synchronizing Meters

(7) Voltage regulator control

(8) Frequency control switch for controlling governor on the turbine

(9) Circuit breaker control switch interlocked with synchronizing relay

(10) Indicating lights

(11) Control wiring, fuses, terminal blocks and name plates

14. Neutral Grounding Resistor

7.2 KV, 100 Amps, 75 Ohms, ten seconds rated grounding resistor with stainless steel resistor elements, aluminum screen enclosure and stainless steel hardware, suitable for indoor installation. The resistor will be furnished with current transformer for ground fault relay operation.

15. D.C. Battery Unit

Lead Acid Battery unit complete with battery racks, automatic charger and battery of adequate size and Ampere hour capacity for electrical operation of the medium voltage circuit breakers will be furnished. Low voltage power for charger (120V A.C.) will be obtained from facility substation or nearest emergency power panel.

16. Cabling and Wiring

- a. 12.4 KV feeders from generator to the switchgear to the unit substation will be 15 KV shielded EPR type copper conductor cable in steel conduit run exposed or P.V.C. underground ducts.
- b. Cable for the neutral grounding resistor will be 15 KV shielded EPR copper conductor cable run in exposed steel conduit.
- c. Low voltage control wiring between the switchgear and control cubicle, grounding resistor and D.C. battery unit will be THHN copper conductor cables in steel conduits run exposed.
- d. Stress relief cones will be provided for all medium voltage shielded cable terminations. Cable shielding will be grounded.

17. 12 KV, 3 phase surge capacitor unit will be mounted in a suitable size termination box at the generator terminals for surge control.

D. INSTALLATION

The installation will comply with all the mandatory, advisory and recommended applicable rules of the following:

1. National Electrical Code
2. National Electrical Safety Code
3. City of Berkeley - Electrical and Safety Code, as applicable

E. TEST & SUBMITTALS

1. Inspection and acceptance tests will be performed on equipment and systems. The contractor will engage the services of a recognized independent testing laboratory for the purpose of performing inspections and tests as herein specified. Inspection and test procedures will comply with the applicable requirements of "Acceptance Testing Specifications for Electrical Power Distribution Equipment & Systems", latest edition, published by the National Electrical Testing Association, Inc. (NETA). The following equipment and systems will be tested:
 - a. Turbine/Generator set, to include medium voltage switchgear, generator control cubicle, neutral grounding resistor coordination and selectivity of protective devices, generator load testing and generator D.C. electrical system.

- b. Power cables, 15 KV and below
 - c. Power and lighting cables, 600 V and below
 - d. Motor Control Centers and distribution switchboard
 - e. Grounding System
 - f. Power and lighting systems operational test
2. Inspection and acceptance tests will be performed by the manufacturer's representative on the following systems:
- a. Intercom and CCTV system
 - b. Fire alarm system
 - c. Gas alarm system
 - d. Emergency power system

* * * * *





APPENDIX K

O&M AND REVENUE ASSUMPTIONS

The following factors, based on engineering estimates, were assumed in calculating the operating and maintenance costs and revenues for the four solid waste management alternatives. Costs and revenues are in 1980 dollars.

1. Maintenance Expendables

A. Items included - expendables include but are not limited to the following:

- oil-lube
- grease-lube
- rubber belting
- welding rods
- hydraulic oil
- gaskets
- seals
- bearings - rollers - ball & pin
- idlers - conveyor & trommel
- chemicals - water treat & cooling tower
- conveyor sprockets
- conveyor flights
- scrubber pellets
- packings, pumps, valves
- toilet articles
- recorder paper
- lights
- paint
- gauges
- sundry incinerator parts

B. Costs - the cost for each of the four alternatives is as follows:

- | | |
|---|--------------|
| • Transfer and Haul w/o Mechanical Separation | - \$0.30/ton |
| • Transfer and Haul w/Mechanical Separation | - \$0.65/ton |
| • Energy Recovery - Cogeneration | - \$1.25/ton |
| • Energy Recovery - Electricity Only | - \$1.25/ton |

2. Electric Power Costs

A. Power Usage (per incoming ton)

- | | |
|---|------------|
| • Transfer and Haul | - 1.5 Kwh |
| • Transfer and Haul
with Mechanical Separation | - 9.8 Kwh |
| • Energy Recovery | - 23.3 Kwh |

B. Power Costs

- The cost of electric power is based on \$0.05/Kwh.

3. Rolling Stock Costs

A. In-plant front end loader

- Transfer and Haul

One small front end loader operating 8 hrs/day, 260 days/yr; 100% utilization

One large front end loader operating 8 hrs/day, 365 days/yr; 75% utilization

- Energy Recovery

One large front end loader - receiving area operating 8 hrs/day, 365 days/yr; 80% utilization

One small front end loader - combustion area operating 24 hrs/day, 365 days/yr; 80% utilization

- O&M Costs

Small loader \$10/hr

Medium loader \$12/hr

B. Haul Vehicles

- Primary Landfills

West Contra Costa (Class I and II-1)

Drop Charge

Haul time

\$7/ton (nonhazardous)

Haul costs

\$40/ton (ash-Class II-1)

Raw refuse

\$106/ton (ash-Class I)

Unprocessibles

44 min (round trip)

Trommel unders

\$2.50/ton (16 ton payload)

Ash

\$3.20/ton (12 ton payload)

\$2.20/ton (18 ton payload)

\$2.90/ton (10 ton payload)

- Secondary Landfill

Vasco Road Landfill (Class II-1)

Drop charge -

Haul time -

\$6.85/ton (nonhazardous)

Haul costs

\$40/ton (ash)

Raw refuse

94 min (round trip)

Unprocessibles

\$4.25/ton (16 ton payload)

Trommel unders

\$5/ton (12 ton payload)

Ash \$5/ton (10 ton payload)

\$3.80/ton (18 ton payload)

Benecia (IT) Landfill (Class I)

Drop charge -

\$106/ton

Haul time -

83 min (round trip)

Haul cost

\$4.50/ton

Ash

- Vehicle Type

- Open-top, live bottom, 90 yd³ (Raw Refuse, Unprocessible, Trommel Unders)

- Tilt Frame - Drop Box (Ash)

4. Insurance: Insurance is calculated at 1% for Transfer Stations, and 0.6% for Energy Recovery facilities, of Base Capital Costs minus Site Preparation.
5. Sinking Fund: A sinking fund for minor equipment replacement (e.g., motors, super-heaters) is assumed at 1% for Transfer and Haul without Mechanical Separation. 3% for all other facilities, of Basic capital equipment costs.
6. Auxiliary Fuel: Auxiliary fuel to be utilized as follows:
 - 100% No. 2 Fuel Oil on a basis of 250,000 BTU/ton of refuse fuel product

Assumed auxiliary fuel characteristics are:

$$\begin{aligned} \text{Heat Value} &= 140,000 \text{ BTU/gal} \\ \text{Costs} &= \$1.10/\text{gal} \end{aligned}$$

7. Secondary Materials Revenues (all prices FOB Berkeley Facility)

A.	<u>Cardboard:</u>		
•	<u>Quantity -</u>	0.2% of 137,500 TPY	
•	<u>Revenue -</u>	275 TPY	
•		@ \$36/ton	
•		\$10,000/yr	
B.	<u>Heavy Ferrous:</u>		
•	<u>Quantity -</u>	0.4% of 137,500 TPY	
•	<u>Revenue -</u>	550 TPY	
•		@ \$70/ton	
•		\$38,000/yr	
C.	<u>Light Ferrous:</u>		
•	<u>Quantity -</u>	0.2% of 137,500 TPY	
•	<u>Revenue -</u>	275 TPY	
•		@ \$30/ton	
•		\$8,000/yr	
D.	<u>Aluminum:</u>		
•	<u>Quantity -</u>	0.2% of 137,500 TPY	
•		275 TPY	
•		@ 85% system availability	
•		235 TPY	
•	<u>Revenue -</u>	@ \$425/ton	
•		\$100,000/yr	
E.	<u>Ferrous Cans:</u>		
•	<u>Quantity -</u>	3% of 137,500 TPY	
•		4,125 TPY	
•		@ 85% system availability	
•		3,510 TPY	
•	<u>Revenue -</u>	@ \$30/ton	
•		\$105,000/yr	

8. Energy Products Revenues

A. Steam/Cogeneration:

• Quantity - 93,600,000 lbs/yr (Cal-Ink demand)
@ 85% system availability

• Revenue - 79,560,000
@ \$6/1,000 #'s*a
\$477,000/yr

B. Electricity/Cogeneration:

Using design parameters previously listed in Table 6-1, gives 205 Kwh/incoming ton.

$$(205 \text{ Kwh/ton}) \times 137,500 \text{ tons/yr} \times 0.85 \times (\$0.062/\text{Kwh}) * b = \$1,500,000$$

C. Electricity Only:

Using Table 6-1, gives 240 Kwh/incoming ton.

$$(240 \text{ Kwh/ton}) \times 137,500 \text{ tons/yr} \times 0.85 \times (\$0.062/\text{Kwh}) * a = \$1,700,000$$

*a The breakdown revenue rate for steam between a cogeneration project and electricity only project is \$4-5/1000 #'s. A rate of \$6/1000 #'s was considered necessary to adequately compensate the City for the added complexity inherent in a cogeneration project.

*b Includes capacity payment of \$0.009/Kwh.

APPENDIX L
FINANCING ALTERNATIVES -
CONSULTANT REPORT

FINANCING ALTERNATIVES
FOR THE
CITY OF BERKELEY'S
PROPOSED RESOURCE RECOVERY PROJECT

AUGUST 18, 1980

BLYTH EASTMAN PAINÉ WEBBER
INCORPORATED

Table of Contents

	Page
Summary and Recommendations.....	i
1.0 Introduction: Investor Requirements.....	1
2.0 Financing Alternatives: Public and Private Options.....	6
2.1 Public Ownership Options.....	6
2.1.1 Revenue Bonds.....	7
2.1.1.1 General.....	7
2.1.1.2 City of Berkeley as Issuer.....	11
2.1.1.3 County of Alameda as Issuer.....	14
2.1.1.4 Joint Powers Authority as Issuer.....	14
2.1.1.5 Special District as Issuer.....	15
2.1.2 Lease Revenue Bonds.....	15
2.1.2.1 Non-profit Corporation as Issuer.....	17
2.1.2.2 Joint Powers Authority as Issuer.....	17
2.1.3 Special District Bonds.....	17
2.1.4 Bonds Secured by a Pledge of Taxes.....	18
2.2 Private Ownership Options.....	20
2.2.1 Industrial Development Bonds.....	22
2.2.1.1 Federal Tax Law.....	22
2.2.1.2 California Pollution Control Financing Authority.....	29
2.2.1.3 Possible CPCFA Financing Structures.....	32
2.2.1.4 Federal Tax Benefits of Private Ownership...	34
2.2.1.5 Leveraged Leasing.....	40
2.3 Preliminary Financing Strategy.....	44
3.0 Impact of Financing Costs on Total Project Costs.....	48
4.0 Federal Assistance Programs.....	50
Exhibits	

Summary and Recommendations

Public and private financing methods which may be applicable to the City of Berkeley's proposed resource recovery project include:

1. Bonds secured by a pledge of taxes;
2. Revenue bonds;
3. Lease revenue bonds; and
4. Industrial development bonds.

In addition, monies available in the City's Refuse Disposal and Development Fund could be used to finance a portion of the cost of the project.

Although, traditionally, the use of bonds secured by a pledge of taxes has represented the safest and lowest cost form of borrowing for local governments, the ability to issue such bonds was terminated by the passage of Proposition 13 in June, 1978. It is noted, however, that Proposition 8, which is expected to be on the November ballot, would restore the City's ability to issue general obligation bonds ("G.O." bonds) with a two-thirds vote of the electorate and would allow the imposition of ad valorem taxes outside the limit of Proposition 13 (i.e. maximum 1% limit on the rate of property taxation). Even if Proposition 8 were to pass, we would not recommend the use of G.O. bonds since this would require the assumption by the City of the financing risks associated with the project.

Under California law, revenue bonds supported by a pledge of the revenues arising from the operation of the project (i.e. tipping fees plus sales of recovered energy and materials), may be issued by a public body. Such bonds are not considered an indebtedness of the issuer and would not require a vote of the City's electors. However, in order to issue such bonds, a procedural ordinance relating to the issuance of revenue bonds would have to be adopted and such

ordinance would be subject to referendum under provisions of the City's charter. Under this alternative, the City would set rates and charges associated with waste disposal to whatever level, together with energy revenues, are needed to pay for debt service and operation and maintenance of the facility. In addition, some level of "coverage", approximating 1.25 times debt service requirements, would be necessary in order to market the bonds and this requirement would add to the annual cost of the project. Although the use of revenue bonds makes sense in a situation where the facility to be financed is expected to operate as an independent economic unit, it is not recommended here because of the higher interest rates expected with such an issue and the higher annual costs which would result from coverage requirements.

In a lease revenue bond financing, a joint powers authority (comprised of the County and the City) or a non-profit corporation would issue revenue bonds and would lease the facility to the City. The sole security for bonds of this type would be rental payments made by the City pursuant to the lease. Such rental payments would equal the annual principal of and interest on the bonds. The source of the lease payments would in turn be tipping fees and energy and materials revenues from the project as described above. Structuring the financing in this manner would allow the bonds to obtain the credit backing of the City, which is normally about one level lower than the City's G.O. bond credit rating. Major advantages associated with this option include 1) the fact that no voter approval is required, 2) the ability to obtain the City's credit backing and resulting lower interest rates, 3) no need for coverage of debt service, and 4) lower annual costs of the project. We recommend the use of lease revenue bonds, together with monies available in the City's Refuse Disposal and Development Fund (as summarized below) to finance that portion of the resource recovery facility which would serve

as a transfer station for the reasons above and also since the City has expressed a desire to own that part of the project.

Industrial development bonds are bonds issued by a public entity for the benefit of a private corporation. Such bonds are secured by payments made to the issuer by the private corporation and therefore, the interest rates thereon are dependent upon the creditworthiness of the corporation itself. In California, the only entity empowered to issue such bonds is the California Pollution Control Financing Authority ("CPCFA"). This financing alternative would allow for private ownership of the project (or a portion thereof) for tax purposes and would enable the private corporation to take advantage of Federal tax benefits of ownership. These benefits, including investment and energy tax credits, deductions for accelerated depreciation and interest expense, are substantial and could be used to the economic advantage of the project in the form of a lower cost of disposal to be charged to the City. We recommend the use of CPCFA financing to finance the resource recovery portion of the project since this is the only option which would satisfy the City's objective of having ownership of that part of the project rest with the private sector. In addition, overall financing, technical and operational risks to the City are reduced under this option.

Monies existing or to exist in the City's Refuse Disposal and Development Fund could be used for a variety of purposes including 1) to pay for a part or all of the transfer station portion of the project, 2) to acquire non-qualifying portion of the project, such as a turbo-generator or 3) to set up reserve or contingency funds for the operation of the project. We recommend the use of these moneys for the first purpose cited above for the following reason: the City's Fund has been built up by assessing a 25% surcharge on the refuse collection rate. Under Proposition 4, which limits government appropriations by establishing a level of

public expenditures based on Fiscal Year 1978, user charges must bear a reasonable relationship to the cost of providing a service. If they do not, rebates (over a period of two years) must be given to those who paid the user charges. The possibility exists that if the City does not use monies in this Fund, it may be compelled to make such rebates. Further, by utilizing current amounts in the Fund, the amount of debt to be issued for the project would be reduced, thereby 1) reducing the annual payments required to service the debt and 2) reducing the amount of revenues required to be generated by the project.

1.0 Introduction: Investor Requirements

The ability to minimize investor concerns relative to the risks associated with resource recovery will be critical to the development of a sound plan for financing the City of Berkeley's proposed resource recovery project. This is because the lenders to a resource recovery project simply are not equity risk takers. They are generally those large institutions (e.g., fire and casualty insurance companies and commercial banks) or wealthy individuals seeking fixed income from their investments in secure undertakings. These lenders demand protection against all risks with the exception of changing bond market conditions. In short, they require assurance that they will be repaid either by: (a) the project's sponsor (i.e., the City), (b) some other interested party (e.g., a private developer and/or project operator) or (c) the project itself.

Because of recent legislative measures in the State of California limiting municipal taxing powers (Proposition 13) and imposing spending limits on state and local governments (Proposition 4), it would not be possible (or desirable) to structure a financing based solely on the City's credit. Bondholder assurances of repayment therefore will have to be derived either from the project itself or through a direct guarantee of the debt by an interested party. In either case the City would need to structure the overall project such that it satisfies the following requirements of the investing community:

1. A strong credit backing

Credit backing may be provided either directly or indirectly from a variety of sources including the City or a project participant (e.g., a full-service contractor or the energy user).

It may take the form of guarantees or contracts which obligate the various project participants to perform their respective functions in such a manner as to satisfy cash flow requirements

of the project. While the credit backing required may be more extensive during the critical construction period than for the operating life of the project, it is important to note that optimistic projections of a project's net income even when coupled with the collateral of a project, are insufficient by themselves to support a financing. This is because the technologies of resource recovery are new and, at least in this country, largely unproven in full-scale commercial operation. To date, insufficient operating experience has been gathered upon which to make sound, long-term technical and financial projections, and resource recovery economics have not achieved the expectations raised on their behalf.

2. Adequate sources of capital.

Adequate sources of capital must be available to insure completion of facility design and construction to meet technical and performance specifications. Such sources may be either public or private and may take the form of grants, debt or equity. Sources of additional capital to meet unforeseen circumstances during plant start-up and operation must also be secured.

3. Continuous supply of solid waste.

The facility must be guaranteed a continuous supply of solid waste and disposal fees over the life of the indebtedness. As the City is responsible for municipal collection, control over a major portion of the waste stream is already assured although control over the disposition of refuse collected by private haulers would need to be obtained and mechanisms for payment established.

4. Long-term energy markets.

Long-term markets for energy must be secured by contract at a price consistent with financial projections. At the minimum, such contracts should obligate the purchaser to take a minimum quantity of energy on an annual basis and pay for it, even though the purchaser may not be in a position to use it when it is available. This is commonly referred to as a "take or pay" contract and is a form of credit backing.

5. Experienced engineers and contractors.

The expertise of the engineers who will design the facility and of the contractors who will construct the facility must be well established.

6. Experienced operators.

There must be assurance that the facility will be properly operated and maintained over the life of the indebtedness to assure the City and other users of reliable, long-term cost-competitive disposal of solid waste; to assure energy and recycled product purchasers of reliable long-term supplies; and to assure the lenders of repayment. This requires careful evaluation of risks assumed by all participating parties recognizing that bondholders assume a minimal amount of risk, that risk adds cost to the debt or, in the worst case, results in an unsalable debt.

7. Availability of stand-by landfill.

There must be available a stand-by facility, or landfill, to accept residue from the processing facility and to provide for disposal in the event of a facility outage. If required, alternative energy sources should be available if contract

provisions call for guaranteed delivery of energy.

8. Sufficiency of revenues.

The revenues derived from the sale of recycled materials, energy and tipping fees must be at least sufficient to pay for the operation and maintenance of the facility and the amortization of the debt and should provide a reasonable level of coverage.

9. Insurance.

An adequate insurance program must be available and maintained during both the construction and operation phases of the project. If properly structured, insurance programs may provide fiscal relief during facility outage and business interruption.

10. Compliance with laws and regulations.

The facility as designed and constructed must meet all Federal, state and local laws and regulations.

In addition to considering the above financial requirements, the City must weigh the relative advantages of private versus public ownership and operation of the facility. Proponents of extensive private sector involvement point to the following advantages:

1. Private industry, having developed proprietary technology of resource recovery, is better equipped in terms of technical, management and marketing skill, to manage a facility.
2. Private industry's profit motive serves as an incentive for efficient plant operation.
3. Industrial purchasers of energy would prefer to deal directly with industry than with government.

5. The Federal tax benefits of ownership, available to a private party but not to the City, can be used to the economic advantage of a project in the form of lower disposal fees.

Advocates of municipal ownership and operation (either with City crews or under separate contract) highlight the following advantages:

1. Retention of complete municipal control over the facility.
2. Lower capital costs because of the use of competitive bidding on equipment and construction services.
3. Acquisition of a facility designed to the specifications developed by the municipality as opposed to general performance specifications.
4. Greater leverage in dealing with potential energy purchasers within the municipality's jurisdiction.
5. Lower costs of disposal since profit or return on investment is not a factor.
6. Retention of ownership after the debt is paid off when the facility may still be operational.

The primary purpose of this report is to identify and compare alternative methods of public and private sector financing for the proposed project and to prepare a preliminary financing strategy for consideration by the City.

2.0 Financing Alternatives: Public and Private Options.

2.1 Public Ownership Options

In the discussion which follows, emphasis will be placed on public debt financing methods involving the issuance of tax-exempt municipal bonds. Section 103 (a) (1) of the Internal Revenue Code of 1954, as amended (the "Code"), provides that interest payments on municipal bonds are exempt to the holder from Federal income taxation. Therefore, political bodies which are qualified to issue such bonds can borrow at lower interest rates than private borrowers of similar creditworthiness. In the State of California, interest income on the debt of most public agencies is also exempt from State income tax.

The following public bodies may issue bonds for a resource recovery facility to be located in Berkeley:

- * the City of Berkeley;
- * the County of Alameda;
- * a Joint Powers Authority (JPA);
- * a non-profit corporation;
- * a Special District; or
- * the California Pollution Control Financing Authority (CPCFA)

The choice of issuer will depend upon the area to be served by the project, the risk-sharing arrangements between the municipal users of the project (if more than the City), public and political attitudes toward the creation of new public agencies (such as a non-profit corporation or Special District) and the choice between public vs. private ownership.

Debt financing instruments which may be issued under current law by some or all of the possible issuers above are:

- 1) Revenue Bonds;
- 2) Lease-Revenue Bonds;
- 3) Bonds secured by a pledge of taxes, and
- 4) Industrial Development Bonds

Since the last alternative is designed for private ownership of facilities, discussion of this option will be deferred until Section 2.2.1.2. A description of each of the other currently available financing alternatives is provided below. (The impact of Proposition 4 on all the financing options was researched in connection with a project being planned in North Santa Clara County. The results of this research are contained in Exhibit 1.)

2.1.1 Revenue Bonds

2.1.1.1 General - Under California law, there are two separate sources of authority for local government entities to issue traditional "revenue bonds" to finance acquisition of "enterprise" facilities which can stand as independent economic units. Such bonds are secured solely by a pledge of the revenues from a certain income-generating facility, and the credit and taxing power of the local government entity are not pledged or committed to pay debt service on the revenue bonds. A solid waste disposal project which receives income from tipping charges and sale of energy or recycled products would be a logical candidate for financing with revenue bonds.

Under the California Constitution, a city or county may not incur any indebtedness without a two-thirds vote of its electors. Court decisions have interpreted this provision to apply only to "indebtedness"

which represents a charge against a city's General Fund. Therefore, traditional revenue bonds, which are not payable from the General Fund but are payable only from a specified source of revenues, are not considered "indebt-edness" requiring a two-thirds vote. The California Legislature, however, has enacted a statute, the Revenue Bond Law of 1941, which as a matter of legislative, but not constitutional, decision sets out procedures and requirement for the issuance of most types of revenue bonds by entities of local government.

The California Constitution contains home rule provisions which exempt any charter city from any inconsistent provisions of state law governing any municipal matters within the scope of concern of the city, subject only to provisions of the California Constitution itself. Since the California Constitution contains no restrictions on the issuance of revenue bonds, charter cities are free to issue revenue bonds without regard to the Revenue Bond Law of 1941, subject only to whatever restrictions or provisions may appear in the charter itself. Further discussion of this source of power to issue revenue bonds will be found below in Section 2.1.1.2.

Under the Revenue Bond Law of 1941 (Government Code Section 54300), a local agency may issue bonds for the acquisition, construction or improvement of any enterprise. "Enterprise" is defined as a revenue-producing under-taking for, among others, "the collection, treatment or disposal of garbage or refuse matter." The scope of collection, treatment or disposal includes but is not limited to "garbage trucks, equipment, dumps, garbage disposal plants, and incinerators or other disposal facilities, including facilities to convert solid waste to energy and reusable materials."

The definition of local agency would include a city, a county or any municipal or public corporation or district authorized to acquire, construct, own or operate a resource recovery facility. Bonds issued by these local agencies under this law would be revenue bonds payable solely from the revenues generated from the operation of the facility and the credit or taxing power of the local agency would not be pledged for the payment of the bonds or their interest. Revenues from facility operations would include charges for waste disposal and income received from the sale of recovered energy and materials.

Prior to the issuance of bonds, the legislative body of a local agency must adopt, by a majority of all members, a resolution to submit to the qualified voters the proposition of issuing bonds. Authorization for the issuance of bonds requires a majority approval of the electorate voting on the proposition. If a joint powers authority or a district were to act as issuer of the bonds under the 1941 Revenue Bond Law, the affirmative vote of a majority of voters within the combined territory of all the local agencies which created the entity would be required. (It is noted that no election is required when a JPA issues lease revenue bonds pursuant to Section 2.1.2.2.) If the issuance of bonds is authorized at the election, the legislative body would provide for their issuance and sale by resolution to take effect upon adoption. Such resolution would pledge or assign all or any part of the gross revenues of the facility as security for the bonds. In its discretion, the legislative body may establish the priority of payments; that is, whether the principal and interest payments on the bonds should take precedence over the payment of operating and maintenance expenses of the facility or vice versa. The resolution may also limit the use of bond proceeds and the issuance of additional bonds for the same purpose and may provide for any other acts necessary

to make the bonds more marketable such as, for example, the establishment of various reserve funds. To ensure sufficient revenues for debt service and operation and maintenance expenses, the local agency may prescribe, revise and collect fees, rentals or other charges for the services provided. Prior to the adoption of a resolution or ordinance prescribing or revising rates and charges, the legislative body of the local agency must give notice of and hold a public hearing at which proposed rates and charges may be changed or modified. It is important to note that a local agency is explicitly granted the power to require its inhabitants to use the resource recovery facility exclusively, thereby assuring a steady flow of solid waste and attendant revenues.

Pursuant to Section 54730, of the Government Code, a local agency may contract with persons to design, construct or operate the facility. The term of such contracts may be for any period not exceeding the time when the principal and interest of all bonds have been fully paid. Any such contracts must be awarded to the lowest responsible bidder and all contracts must be approved by the affirmative vote of four-fifths of the legislative body.

The maximum rate of interest on bonds issued under the Revenue Bond Law of 1941 previously could not exceed 8% per year payable annually or semi-annually. However, legislation was passed recently and signed into law which raises the limit for cities, counties and special districts to 10%.

Financing under the 1941 Revenue Bond Law results in conventional revenue bond or user charge financing and is used to finance projects which are expected to act as independent economic units. Bondholder security for a resource recovery project so financed would be derived firstly from the local

agency's ability to set rates and charges sufficient to cover debt service and operation and maintenance, and secondly, from the strength of the energy sales contract. Maximum protection would be provided by a "hell or high water" contract with an energy user. For practical purposes, the likelihood of obtaining such contract, however, is nil. A somewhat lesser but still adequate level of protection may be obtained by a "take or pay" contract whereby the energy user would agree to take a minimum quantity of energy and pay a minimum amount for it if it is available, whether or not he could use it. In a "take and pay" contract, the user would pay only for the amount of energy it actually received.

Additional security features which could be structured into the financing would include a mortgage on the facility for the benefit of the bondholders as well as the establishment from bond proceeds of reserves such as 1) a debt service reserve fund, typically in an amount equal to the maximum annual principal and interest payment, 2) an equipment renewal and replacement fund and 3) an operating contingency fund. Covenants in the resolution would limit the use of moneys in those funds to specific purposes. The resolution could also require that the revenues of the project provide a safety factor called "coverage". Required coverage might typically be 1.25 times annual debt service after payment of operation and maintenance expenses.

As stated earlier, the choice of issuer is dependent upon many factors including, among others, the area to be served by the facility. In the following, the relative benefits and disadvantages of the City, the County or some other public agency acting as issuer are reviewed.

2.1.1.2 City of Berkeley as Issuer

The City of Berkeley would be a logical choice to act as issuer of the bonds if the facility were designed to handle wastes generated only within

the City's boundaries. The City would retain total control over the facility and its operations and could use its discretion in setting rates and charges, operating the facility with City personnel or through a contract with a private firm, determining the types of covenants to be included in the bond resolution, etc.

The level of rates and charges to be set by the City would depend upon the nature and strength of the energy contract. Theoretically, the rates could be set as high as necessary to pay for debt service and operation and maintenance without reliance on energy revenues. As a practical matter, however, rates would be set based on reasonable estimates of the energy revenues to be derived so as not to cause a large increase over current disposal costs.

If the City desired to contract out the operation of the facility to the private sector, service payments to the operator could be made in several ways. The first option would be simply to pay the operator a management fee for operating the facility, with the City still being responsible for operation and maintenance expenses. Another option, which would transfer some risk to the operator, would be to enter into a service contract and pay an agreed maximum amount for operation and maintenance (with escalation), such amount to include a profit to the operator. Any overruns in operation and maintenance costs which are not due to force majeure or a fault of the City would be borne by the operator. Such contract could include a revenue-sharing formula as an incentive to the operator. As the operator would be assuming a substantial risk, it would probably require that the City enter into a "put or pay" type contract for the delivery of solid waste. Such contract would obligate the City to deliver or cause to be delivered a minimum annual

quantity of refuse and to pay a minimum amount for its disposal regardless of whether that minimum amount was actually delivered. Exhibit 2 summarizes recent research conducted to determine if the City could enter into a "put or pay" contract (since the California constitution forbids cities from entering into long-term obligations which exceed the available revenues of the City in any fiscal year except with a two-thirds vote of the electorate).

The City of Berkeley has no provisions in its charter dealing with the issuance of revenue bonds. Therefore, the City is free to establish, by ordinance or charter amendment, whatever provisions it desires with regard to the authorization and issuance of revenue bonds to finance municipal projects, and City revenue bonds are therefore not subject to the provisions of the Revenue Bond Law of 1941. This means that the City of Berkeley can issue revenue bonds to finance its Solid Waste Management Center without the requirement of a vote of its electors, and without any interest rate limitation. The City may, however, choose to subject itself to any or all of the foregoing provisions, or any other provisions contained in the Revenue Bond Law of 1941. In any event, some citizen involvement in the issuance of revenue bonds would be assured, because to issue such bonds, the City would have to adopt a procedural ordinance setting forth the conditions for the issuance of revenue bonds. This ordinance would be subject to referendum under provisions of the Berkeley City Charter, so that if a sufficient number of citizens opposed the ordinance, its adoption could be subject to voter approval pursuant to the referendum provisions.

2.1.1.3 County of Alameda as Issuer

While it is technically possible for the County to act as issuer, it is unlikely that voters in the County would approve a proposition to issue bonds for a facility whose major beneficiary would only be the City of Berkeley. Even if voter approval could be obtained, this option would not be desirable from the City's standpoint since it would lose operational control over the facility. This would expose the City to the possibility of uncontrollable increases in the price for disposal and would preclude its input in a bond resolution and energy sales contract.

2.1.1.4 Joint Powers Authority as Issuer

If authorized by their legislative or other governing bodies, two or more public agencies (e.g., the City of Berkeley and the County or another city, public corporation or district) may jointly exercise any power common to the parties, as for example acquisition, construction and operation of a resource recovery facility. The parties would enter into a joint exercise of powers agreement which would state the power to be exercised and which could either designate a specific party to the agreement to serve as prime contractor for the others or which would form a new commission to serve all of the municipalities involved. The resulting agency (joint powers authority or JPA) constitutes a new public entity separate from the parties to the agreement. A joint powers authority of which the City of Berkeley is a member is already in existence. Recently, JPA's were empowered to issue revenue bonds to finance resource recovery facilities under the 1941 Revenue Bond Law (Gov. Code 6579.5). It is, therefore, now technically possible for JPA's to issue

bonds supported solely by the revenues of the project. Bondholder security would be provided from (1) the JPA's ability to set rates and charges sufficient to pay debt service on the bonds and operation and maintenance expenses of the facility and (2) the energy sales contract.

While it might make sense to use the JPA (particularly if a number of other municipalities are to use the facility) and whereas the City, as a party to the agreement, could still exercise substantial control over the project, from a credit point of view, it would be more desirable to issue lease revenue bonds as opposed to 1941 Act revenue bonds. This is because the credit of the lessee public entity would be pledged for the lease payments as opposed to the pledge of project revenues and this would enhance the rating of the bonds. Furthermore, under the 1941 Revenue Bond Law, the JPA would have to incur the time and expense of a voter election on the proposition of issuing bonds while such election would not be required with lease revenue bonds. (See Exhibit 3, discussion of AB 3210)

2.1.1.5 Special District As Issuer

While it is theoretically possible for a special district to issue bonds under the 1941 Revenue Bond Law, as discussed in Section 2.1.3, it is unlikely that the formation of such a district would be approved by the Local Agency Formation Commission.

2.1.2 Lease Revenue Bonds

Lease revenue bonds constitute a variation of the user charge revenue bonds described in Section 2.1.1 above. For lease revenue bond financing, a public agency such as a specially formed non-profit corporation or a joint powers authority issues tax-exempt revenue bonds to finance the cost of constructing a facility to be leased to a public entity such as the City or the County.

The sole security for bonds of this type is the lease for the completed facility for an annual rental at least equal to principal of and interest on the bonds. The lease may also require the lessee to operate and maintain the facility or to pay for such expenses through additional rental. The lessee may, in turn, use project revenues as the source of rental payments but may also use other sources of revenues legally available to it. Structuring of the financing in this way allows the bonds to obtain the credit backing of the lessee public entity, which is normally about one level lower than that entity's general obligation bond credit rating.

The lessee typically has great flexibility in imposing rates and charges to meet its rental obligations but the aggregate of this income need not provide the additional debt service coverage required when using 1941 Act revenue bonds. In this way, the level of the rates and charges may be kept lower than it would be with 1941 Act revenue bonds.

A requirement of this type of financing is that the facility to be leased must be completed before the lessee's rental payments can commence. As such, a more restrictive construction contract is required with liquidated damages imposed upon the contractor for failure to complete within the time allowed. Performance bonds and labor and materials bonds are also a necessity. (It is noted that such bonds and the liquidated damages provisions may also be required for 1941 Act revenue bonds, particularly if completion of the facility is a prerequisite to the imposition of user charges or the raising of such charges to a higher level.)

A major advantage to the use of lease revenue bonds is that authorization for their issuance usually does not require voter approval. No such approval appears to be required under the Berkeley City Charter. In addition, lease payments made by the lessee entity are not considered debt counting against

any statutory debt limits (except for the County) and are treated as an operating expense of the lessee.

Lease revenue bonds issued by a JPA are subject to interest rate limitations of 10%; bonds issued by a non-profit corporation are not so restricted.

2.1.2.1 Non-profit Corporation as Issuer

A non-profit corporation (NPC) may be formed by or on behalf of a municipality. Directors of the NPC must be appointed by or approved by the municipality that will receive the NPC's assets upon retirement of any indebtedness incurred. An NPC may be subject to possessory interest taxes on its facilities and comments relating to competitive bids and budget limitations of a JPA (below) apply also to an NPC.

Costs of bond issuance might be higher and the time required might be longer than for a JPA because of the approval needed from the California Commission of Corporations and a no-action letter from the Securities and Exchange Commission. Compliance with blue-sky and other securities laws of the various states must also be made to offer bonds therein.

2.1.2.2 Joint Powers Authority as Issuer

A JPA, formed as described in Section 2.1.1.4, must offer its lease revenue bonds at public competitive sale if the lease payments are made by a public entity and the par value of the offering exceeds \$500,000: Proposition 4 may affect the ability of the lessee to include in its budget sufficient moneys to make the lease payment. Prior to passage of Propositions 13 and 4, lease revenue issues were usually rated one grade below the lessee's general obligation bond rating. (See Exhibit 1).

2.1.3 Special District as Issuer

Theoretically, it may be possible to form any number of special districts for purposes of financing the proposed resource recovery facility (e.g., County Sanitation or Sanitary District). However, entities of this type would

require the approval of the Local Agency Formation Commission ("LAFCO"). It has been the policy of LAFCO to disapprove of the creation of a new political subdivision where presently existing public entities can provide the same service. In view of the fact that the City of Berkeley, the County of Alameda or the City by contract with the County or any one or more user municipalities in an exercise of joint powers agreement could provide the resource recovery services contemplated, it is unlikely that LAFCO approval could be obtained. As such, this option is dismissed as being without merit in the present situation.

2.1.4 Bonds Secured by Pledge of Taxes

Traditionally, the safest and lowest cost form of borrowing for local governments has been through bonds which are secured by a pledge of the taxing power of the local entity, rather than by a pledge of revenues from an income generating enterprise. In California, cities had the power to issue General Obligation Bonds which were secured by a pledge to levy property taxes unlimited in rate or amount sufficient to pay the debt service on the bonds. The issuance of such bonds was subject to two-thirds voter approval and was subject, in the case of charter cities, to any restrictions in the charter on the maximum amount of indebtedness (usually expressed as a percentage of the assessed valuation of properties in the city) which could be incurred.

Traditional general obligation bonds were terminated by the passage of Proposition 13 in June, 1978, because Proposition 13 set a maximum 1 percent limit on the rate of property taxation, which is inconsistent with the unlimited pledge necessary to create general obligation bonds. There is pending in the California Legislature a proposed constitutional amendment to revise Article XIII A of the California Constitution (which was adopted by Proposition 13). This proposed amendment would restore the ability of local governments

to issue traditional general obligation bonds, under the same conditions as had existed prior to 1978. No strong opposition to this constitutional amendment has been expressed in the Legislature, and it seems likely that the Constitutional Amendment will appear on the November, 1980 ballot for approval by the voters of the State. If approved by a majority of the voters in November, such a Constitutional Amendment would become effective on the date after the election.

If Article XIII A of the Constitution is not amended to restore the power to issue traditional general obligation bonds, and alternative method is available under present California law for cities to issue bonds secured by a pledge of certain taxes. This legislation permits cities to finance the acquisition of public facilities through bonds secured by a pledge of sales and use tax revenues (Government Code §43648 et seq., as amended by Chapter 650, Statutes of 1979, effective January 1, 1980). Under this law, bonds may be issued only after two-thirds voter approval. Furthermore, the amount of bonds that may be issued may not exceed an amount, the debt service on which will require more than two-thirds of the sales and use tax revenue of the city in the year that the bond election is called (e.g., the statute maintains a "coverage" of one-third of the sales taxes to offset any possible reduction in sales tax revenues in future years). These bonds are not a pledge of the credit or taxing power of the city in question, and are limited obligations secured solely by the pledge of sales and use taxes.

2.2 Private Ownership Options

The preceding section was devoted to public debt financing methods involving the issuance of tax-exempt bonds where the City of Berkeley, or some other public entity, would be the owner of the facility. The purpose of this section is to discuss a method of tax-exempt financing whereby ownership of the facility would rest with the private sector, namely industrial development bonds issued by the California Pollution Control Financing Authority (CPCFA).

It is important to recognize that while a number of other sources of loans and capital are available to private corporations, very few resource recovery projects have been financed on a totally private basis through such mechanisms of capital formation as stocks, debentures or loans. The reason for this, and one which has been muddled by the myth that there is "gold in garbage," is that the current economics of resource recovery simply do not allow for a satisfactory Return on Investment (ROI) when compared with other investment opportunities a private firm might have. Almost without exception, major corporations set hurdle rates with respect to ROI, which, if not met in pro forma projections, result in negative investment decisions. Typically, a private firm might look for an after-tax ROI of 12-20%. To date, those privately financed resource recovery facilities have been unable to realize an ROI which even approximates these goals due to a multitude of both technical and institutional problems.

A key concern to a private corporation is the impact a financing may have on its balance sheet. The appearance of debt on a corporation's balance sheet may severely affect financial ratios and hence its ability to borrow for other purposes. Further, restrictive covenants in an indenture or loan agreement may actually preclude direct debt financing for another project.

An analogy may be drawn between a private corporation's balance sheet concerns and a municipality's concerns over approaching its statutory limit on bonded indebtedness. Municipalities generally prefer to issue debt which is not includable in the calculation of bonded indebtedness since such debt does not impact their borrowing capacity and ability to finance other projects which serve a public purpose. By obligating itself to repay a debt for a resource recovery facility, a private corporation weakens its credit standing and may find itself having to borrow at higher interest rates for other unrelated corporate activities.

An additional consideration is that while resource recovery facilities are often compared to manufacturing facilities, there are key differences between these that deter private investment in the former. For example, in a typical manufacturing facility, the price of a finished product may be increased to pass along to the consumer increased production costs. A resource recovery facility, on the other hand, is constrained by long-term contracts which specify the formulae prices to be paid for both disposal services and energy products. "Arbitrary" increases in the price of the service or the products simply cannot be made. In addition, a private corporation generally has much more direct control over those factors which affect the operation of a manufacturing facility than those affecting a resource recovery plant. Specifically, such factors as control of the waste stream or potential tightening of environmental standards requiring additional investment in nonremunerative pollution control equipment are completely beyond the control of the private sector.

While the above briefly explains the key economic reasons for the lack of private investment in resource recovery facilities in general, the very nature of the major companies currently in the business supports the lack of private investment in resource recovery. In looking at those firms that are now supplying resource recovery services and equipment, certain generalizations may be made:

1. Resource recovery represents only a minor portion of the firm's total activities and as such, receives relatively modest corporate financial support;
2. Resource recovery is part of a diversification effort. As a relatively new venture, corporate managements are adopting a "wait and see" attitude before making major investments. Examples of firms which have done this include Monsanto, Union Carbide and most recently, Occidental Petroleum and American Can, all of whom are ceasing resource recovery marketing activities; and
3. Few firms have had actual experience in the design, construction and operation of resource recovery facilities. The capital intensive nature of resource recovery plants, together with the high level of risks and uncertainties, dictates prudence and an emphasis on established and proven lines of business.

2.2.1 Industrial Development Bonds

2.2.1.1 Federal Tax Law

The Federal tax law relating to tax-exempt industrial development bond ("IDB") financing is contained in Section 103 of the Internal Revenue Code of 1954, as amended. This Section has been implemented by regulations (the "Regulations") issued by the Internal Revenue Service ("IRS"). The Regulations have been, and are continually being, interpreted and applied by the IRS in the issuance of rulings relating to prospective tax-exempt financings. The

tax rules relating to IDB's are extensive and highly technical in nature. It is, therefore, necessary to explore them in some detail.

As stated in Section 2.1, Section 103 (a) (1) of the Code provides that gross income of a taxpayer for Federal tax purposes does not include interest on obligations of a state or a political subdivision thereof. Section 103 (b) (1) of the Code in effect provides that, subject to certain exceptions, the interest exemption stated in Section 103 (a) (1) does not apply to industrial development bonds.

Section 103 (b) (2) defines an "industrial development bond" in terms of use of proceeds and source of payment. The use of proceeds condition, known as the "trade or business test," is that the bond is part of an issue more than 25% of the proceeds of which are to be used directly or indirectly in any trade or business carried on by any "non-exempt person."

The source of payment condition, known as the "security interest test," is that the payment of principal or interest is more than 25% secured by any interest in property to be used in a trade or business or secured by payments in respect of such property, or is to be derived from payments in respect of property or borrowed money used in a trade or business. If both the trade or business test and the security interest test are met, the bonds are IDB's and the interest thereon is taxable with certain exceptions.

Section 103 (b) (4) provides that Section 103 (b) (1), which makes the interest on IDB's taxable, will not apply to any obligations which are part of an issue used to finance certain "exempt facilities." These "exempt facilities" include, among others, solid waste disposal

facilities. Such treatment reflects a belief that where a contemplated activity is of particular public interest and not readily susceptible to being carried out by governmental units, an exception ought to be provided to the exclusion from tax-exempt status.

The Regulations define a solid waste disposal facility as property used for the collection, storage, treatment, utilization, processing, or final disposal of solid waste. Solid waste is defined in Section 203 (4) of the Solid Waste Disposal Act, which states that the term "solid waste" includes "garbage, refuse, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agriculture operations, and from community activities, but does not include solids or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants." However, to qualify for tax-exempt financing, the solid waste to be disposed of must be valueless at the place where it is located. If anyone is willing to purchase the material at any price, it will not qualify as solid waste.

On June 20, 1975, the Treasury Department issued Temporary Regulations which revised some of the prior existing Regulations relating to Section 103 (b) (4) (E). These Temporary Regulations are of particular interest because they may be regarded to some extent as a liberalization of the IRS's position with respect to the financing of solid waste disposal facilities.

The Temporary Regulations do not revise the definition of solid waste or a solid waste disposal facility. The Temporary Regulations still provide that a facility which disposes of solid waste by reconstituting, converting or otherwise recycling solid waste into material which is not waste qualifies as a solid waste disposal facility if solid waste constitutes at least 65% by weight or volume of the total materials introduced in the recycling process.

The Temporary Regulations provide that where a facility performs a solid waste disposal function and some other function, the cost of such facility must be allocated between the respective functions. A facility which otherwise qualifies as a solid waste disposal facility will not be treated as having a function other than solid waste disposal merely because material or heat which has utility or value is recovered or results from the disposal process. However, where materials or heat are recovered, the waste disposal function includes only the processes which are necessary in order to put such material or heat into the form in which they are, in fact, sold or used. The waste disposal function does not include further processing which converts the materials or heat into other products. Thus, the recovery of salable scrap metal or the creation of valuable steam will not preclude tax-exempt financing of a facility and will not necessitate an allocation of the facility's cost between the solid waste disposal function and the sale of scrap metal and the creation of steam. However, any portion of the facility that performs an additional conversion process or any comparable function will not qualify for tax-exempt financing under the solid waste disposal exception. Thus, a steam pipe to carry steam generated by a facility to a steam user's plant would not qualify and the same would be true with respect to equipment such as fans and ductwork or conveyors used to transport fuel recycled from waste to a third party's boiler. It is noted that a solid waste disposal facility

will not fail to qualify as an exempt facility simply because it operates at a profit.

The Regulations establish certain other requirements for tax exemption. The Regulations require that at least 90% of the net proceeds of the Bonds remaining after payment of the costs of issuance thereof (including funded reserves, capitalized interest and the underwriter's discount) must be used to provide costs of those portions of the facility which qualify as solid waste disposal facilities and which are properly chargeable to the facility's capital account. The remaining 10% of the net proceeds of the bonds (often referred to as the "insubstantial portion" may be used to finance any items qualifying under the state statute pursuant to which the bonds are issued. This would include those components of the facility which do not qualify as solid waste disposal facilities for Federal tax purposes.

The Regulations also require that the issuer adopt a bond resolution or take some other similar official action prior to the commencement of the construction, reconstruction, or acquisition of the facility and that the bonds be issued no later than one year after the facility is first placed in service.

The recently enacted Crude Oil Windfall Profit Tax Act (the "Act") contains provisions which affect industrial development bond financing for solid waste disposal facilities. A summary of those provisions is provided below and a memorandum on the subject by Messrs. Orrick, Herrington, Rowley and Sutcliffe is in Exhibit 4.

Effect of Crude Oil Windfall Profit Tax Act of 1980
on Above Discussion

A new subsection (g) has been added to section 103 of the Code which expands the definition of solid waste disposal facilities which qualify for tax-exempt industrial development bond financing. Industrial development bonds may now be used for a "qualified steam-generating facility." A "qualified steam-generating facility" means a steam-generating facility for which:

- (A) more than half of the fuel (determined on a Btu basis) is solid waste or fuel derived from solid waste, and
- (B) Substantially all of the solid waste derived fuel is produced at a facility which is--
 - (i) located at or adjacent to the site for such steam-generating facility, and
 - (ii) owned and operated by the person who owns and operates the steam-generating facility.

This last rule does not appear to permit operation of the facility by a person other than the owner. Further, the owner must be the owner for "tax purposes", presumably entitled to depreciation deductions, and not the holder of mere record title. Accordingly, a purchaser of RDF from an unrelated manufacturer of the fuel will not generally be entitled to finance an RDF-fired steam generator with tax-exempt IDBs.

A qualified steam-generating facility includes incinerator, boilers, smokestacks, and precipitators and other property used in the generation of steam. However, such a facility would not include property used in the transmission of steam.

In lieu of the restrictions on the location, ownership and operation of the facilities discussed above, a special rule is applicable to steam generating facilities owned by a State or political subdivision of a State if (i) substantially all the RDF used at the steam generating facility is produced at a facility which is owned

and operated by or on behalf of the same State or political subdivisions thereof which own the steam generating facility, and (ii) if substantially all the solid waste processed at the RDF facility is collected from the area in which the steam generating facility is located and which is within the jurisdiction of the governmental unit or units owning the facility.

Another provision contained in the Crude Oil Windfall Profit Tax Act is designed to assist the economic viability of solid waste disposal facilities by encouraging an expansion to the market for the sale of steam and electric energy produced from a solid waste disposal facility by permitting the use of IDBs to finance resource recovery facilities where the steam and electricity will be sold to a Federal agency or instrumentality. Although this provision does not directly amend section 103 of the Code, it, nevertheless, provides that an obligation issued by an authority for 2 or more political subdivisions substantially all (90%) of the proceeds of which are to be used to provide a "solid waste-energy producing facility" will be treated as a tax-exempt Industrial Development Bond issued by a political subdivision of a State. This provision is designed to provide that bonds to finance "solid waste-energy producing facilities" will not lose their tax-exempt status because the financed facilities are used for the benefit of the Federal government or because the debt service on the bonds is derived from payments by the Federal government with respect to such use.

A "solid waste-energy producing facility" consists of both a facility to dispose of solid waste and a facility for the production of steam and electricity where (i) substantially all the fuel for the steam and electric generating facility is derived from solid waste processed in the related solid waste disposal facility, (ii) both

such facilities are owned and operated by the authority which issues the obligations and, (iii) all the steam and electricity produced at the facility (and not used by the facility) must be sold, for purposes other than for resale, to an agency or instrumentality of the Federal government. The requirement that substantially all, presumably 90%, of the fuel for a solid waste-energy producing facility must be derived from solid waste may be compared to the less restrictive requirement applicable to a qualified steam-generating facility that only one-half of the fuel for the generation of steam must be derived from solid waste. Since a solid waste-energy producing facility consists of both the solid waste disposal and energy generating portions of a resource recovery facility, it appears that the availability of tax-exempt IDBs for a facility which meets the above requirements may be determined without regard to the restrictions otherwise applicable under section 103(b) of the Code to a solid waste disposal or qualified steam-generating facility.

A solid waste-energy producing facility will be considered to be operated by the authority where the authority enters into a management agreement with a private concern for a term, including any options, which does not exceed one year.

Examples of equipment which qualify as steam and electric energy facilities are incinerators, boilers, precipitators, smokestacks, internal steam distribution lines, turbines, generators and structures for housing such equipment. However, the qualifying facility only includes equipment up to the transmission stage.

2.2.1.2 California Pollution Control Financing Authority

Currently, in the State of California, IDB's for a resource recovery facility may be issued only by the California Pollution Control Financing Authority (CPCFA). CPCFA was created in 1972 (Health & Safety Code 33400 et. seq.) to provide for pollution control revenue bond financing

for California industry facing major pollution control expenditures. Among the solid waste projects which may qualify for CPCFA financing are:

- a) Projects utilizing recognized resource recovery or energy conversion processes;
- b) Projects utilizing new technologies or processes for resource recovery or energy conversion; and
- c) Other projects for the reduction of environmental pollution resulting from the disposal of solid waste.

To qualify for tax-exempt CPCFA financing, a solid waste facility (a) must comply with Regulations issued by the IRS for facilities which can be financed using IDB's, i.e., Section 103 (b) (4) (E) or 103 (b) 6 of the Internal Revenue Code of 1954, as amended; and (b) must pass the review criteria established by the CPCFA and the California State Solid Waste Management Board.

In a typical CPCFA financing, the Authority, as lender, lessor or seller (See Section 2.1.2.3), and a private corporation enter into a long-term contract pursuant to which the private concern makes periodic payments based upon the project costs, interest rates and the useful life of the facility. The Authority funds the contract by issuing its revenue bonds secured solely by the credit of the private concern plus other collateral such as a mortgage on the project, and a pledge of the revenues arising from the operation of the facility. The Authority acts solely as a vehicle for tax-exempt financing and neither the credit of the State nor that of any local government body is pledged for repayment of principal and interest on the bonds.

CPCFA may issue bonds for a private concern in any amount and without regard to statutory limitations on interest rates. The proceeds of such bonds may be used to finance transfer vehicles, transfer stations, source separation facilities, land, buildings and any facilities used for the collection, storage, treatment, utilization, processing and final disposal of solid waste. It should be noted, however, that facilities which do not qualify for

tax-exempt financing under the Regulations (e.g., a steam line or turbo generator) may qualify for CPCFA financing by utilizing the 10% "insubstantial portion" or by utilizing a separate \$1.0 million IDB exemption. Bond proceeds may also be used to finance engineering, related professional and financing costs and administrative fees.

To apply for CPCFA funding, a private firm must submit an application for financing to the Authority at the time the project is being planned. The Authority holds monthly meetings at which applications are considered and action is taken on resolutions. If a project is found eligible, CPCFA issues an initial resolution establishing formal eligibility for tax-exempt financing. Such resolution remains in effect for one year but may be extended by agreement with CPCFA. If construction on a project has started prior to the Authority's adoption of the initial resolution, only costs being paid or incurred from that point forward are eligible for tax-exempt financing.

CPCFA charges a fee for its services which must be submitted together with the private concern's application in order for the application to be considered. Currently, the application fee is 1/20th of 1% of the amount to be financed (but not less than \$250 or more than \$5,000). At the time of bond issuance, a fee of $\frac{1}{2}$ of 1% is imposed. Such fees may be recovered from bond proceeds.

Two bills are now pending in the Legislature to authorize the issuance of industrial development bonds by agencies other than CPCFA. A discussion of those bills is contained in Exhibit 5.

2.2.1.3 Possible CPCFA Financing Structures

There are three basic methods of structuring a CPCFA financing for a private company: (1) a loan, (2) an installment sale and (3) a lease (with option to purchase at the end of the lease term for a nominal sum).

The simplest method of structuring a financing agreement is a loan transaction. Under this arrangement, CPCFA loans the proceeds of the bond issue to the private company to enable it to acquire or construct the facility. The company agrees, either in the loan agreement or in a promissory note issued pursuant to the loan agreement, to make loan repayments to CPCFA sufficient to pay principal of and interest on the bonds. Generally, the security for the bonds is only the obligation of the company to make payments, and the bonds are rated accordingly.

In an installment sale agreement, CPCFA uses the proceeds from the sale of the IDB's to acquire or construct the facility which it sells to the company for a purchase price sufficient to pay principal of and interest on the bonds. The obligation of the company to make purchase price payments may be either in the installment sale agreement itself or may be in a promissory note issued pursuant to the installment sale agreement. Title to the facility may pass to the company either upon completion of construction of the facility or upon full payment of principal and interest on the bonds. If title passes immediately at the end of facility construction, the installment sale then becomes a loan agreement for all intents and purposes.

In a lease transaction, CPCFA uses the proceeds from the sale of the IDB's to acquire or construct the facility and leases the facility to the company for rental sufficient to pay principal and interest on the bonds. (In most cases, the company is actually responsible for construction of the facility.) In the lease agreement, the company is given an option to purchase the facility for a nominal sum.

In all cases, the financing is secured by the credit of the company for whom the financing is being accomplished. Additional agreements such as a guaranty or mortgage may be used to improve the credit rating of the bonds. In a guaranty agreement, which is normally used if the financing is structured as a lease or if a subsidiary is the party to the agreement, the parent company directly guarantees to the CPCFA the prompt and full payment of principal of and interest on the bonds. This assures the lenders that they will rank on par with all other unsecured creditors of the parent company in the event of bankruptcy proceedings. If a mortgage is used, CPCFA and the company both grant to the bondholders a mortgage interest in the facility. Just how much the credit rating of bonds would be improved by granting a mortgage on the facility is difficult to determine. Since the resource recovery portion of the project would be considered a special purpose, limited use facility, its value in default would be questionable. This is not the case with the transfer station portion of the project since it could continue to be used for its intended purpose by others. However, if the City were to own the transfer station and attempted to place a mortgage on it, it is possible that such mortgage could be considered indebtedness, thereby requiring a vote of the electorate. This issue should be investigated by the City's legal Counsel.

2.2.1.4

Federal Tax Benefits of Private Ownership: Regardless of whether the financing was structured as a loan, an installment sale or a lease, for Federal income tax purposes, the transaction would be viewed as a loan of the Bond proceeds by the issuer to the private company. The private company would therefore be deemed the "tax owner" (or "beneficial" or "constructive owner") of the facility and would be entitled to a number of Federal tax benefits. The preservation of these benefits is primary tax objective of the private company and care must be exercised in structuring the agreements with the issuer to ensure their availability. These tax benefits are as follows:

Investment Tax Credit

Under current law, a taxpayer is entitled to a regular investment credit with respect to an investment in certain tangible property. The amount of the credit is 10% of a taxpayer's cost in acquiring or constructing eligible property and the credit is used to offset the taxpayer's income tax liability. To be eligible for the credit, property must be depreciable with a useful life of three years or more. Qualifying property includes tangible personal property such as machinery and equipment and special purpose structures but does not generally include buildings or their structural components.

The investment credit may be used to offset the first \$25,000 of tax liability plus a percentage of tax liability in excess of \$25,000. This percentage is 70% for 1980 and will increase to 80% in 1981 and 90% in 1982 and later years.

Energy Tax Credit

In addition to the regular investment credit above, present law provides an energy tax credit of up to 10% of the cost of certain defined property. Like the regular investment credit, the energy credit is also used to offset the taxpayer's liability

and applies only to depreciable property with a useful life of three years or more. Qualifying property generally includes equipment which utilizes certain energy resources other than oil or natural gas and specifically includes equipment to recycle solid waste. The energy credit is also available for structural components of a building which otherwise qualify as energy property but does not extend to energy property used to provide electrical, gas, steam, and other public utility services.

The Crude Oil Windfall Profit Tax Act contains certain provisions which delay the termination date of the energy credit rules, expand the definition of energy property, and otherwise alter the application of the energy credit rules. A brief discussion of the provisions which affect the energy tax credit applicable to solid waste disposal facilities follows.

A. Additions to Energy Property Items

The Act adds RDF storage facilities and cogeneration equipment to the list of energy property defined in Code section 48(1) which qualify for the energy tax credit.

1. RDF Storage Facilities. Under existing law most of the property relating to a resource recovery facility is eligible for the energy credit under either paragraph 6 (relating to recycling equipment) or paragraph 7 (relating to alternative energy property) of Code section 48(1). The Act adds to the items of property eligible for the credit equipment used for the storage of fuel derived from garbage at the site at which such fuel is produced.

2. Cogeneration Equipment. The 10% energy credit is made applicable to "co-generation equipment", which is property enabling a boiler or burner to both produce steam, heat or other useful energy and also produce electricity. To qualify for the credit, such equipment must be property installed in an existing (as of January 1, 1980) industrial or commercial facility, including agricultural and

water purification and desalinization facilities to either increase or initially provide cogeneration activity at the facility. Further, such equipment must be part of a system which does not use oil, natural gas, or any product thereof except for startup, backup or flame stabilization purposes to provide not more than 20% of the fuel consumed by the system each year, determined on a Btu basis.

Equipment to replace existing cogeneration equipment will be eligible for the credit only to the extent attributable to an incremental increase in cogenerating capacity. Equipment will not qualify for the credit if it merely increases the capacity of the system to produce the primary energy product of the existing cogeneration system.

B. Changes in Amount and Period of Application of Energy Credit.

Under current law the maximum energy credit is 10% of the qualifying investment in energy property and the credit is only available through December 31, 1982. Under the Act, the credit is extended through December 31, 1985 for "biomass property".

Biomass property is property to convert biomass into a synthetic solid fuel, or to burn such fuel or biomass, or to convert biomass to alcohol for fuel purposes if the equipment producing the alcohol uses a primary energy source (i.e., more than 50% of the full energy requirement) other than oil, natural gas, or a product of oil or natural gas. Qualifying equipment includes handling, storage, and preparation equipment for biomass fuel or feedstock and pollution control equipment otherwise eligible for the credit.

Biomass is broadly defined as any organic substance other than oil, natural gas, or coal, or any product thereof. Biomass includes waste, sewage, sludge, grain, wood,

oceanic and terrestrial crops and crop residues, and includes waste products which have a market value, but does not include waste materials which include processed products of oil, natural gas or coal, such as used plastic containers and asphalt shingles.

C. Double-dipping Provisions.

Under present law the energy tax credit is reduced to 5% if the property is financed in whole or in part by the proceeds of a tax-exempt IDB. The Act contains a provision designed to avoid the availability of the double benefit of coupling the energy tax credit with tax-exempt financing or some other government subsidy and, thereby, force the investor in energy property to choose between the tax credit, on the one hand, and tax-exempt financing or other government subsidy, on the other hand.

Under the Act, if investment in energy property is financed in whole or in part by IDBs or by subsidized energy financing the amount of investment eligible for the energy credit is reduced by the following fraction:

$$1 - \frac{\text{Investment allocable to IDBs or subsidized financing}}{\text{Total investment}}$$

Subsidized financing means financing provided under a Federal, State or local program, a principal purpose of which is to provide subsidized financing for projects designed to conserve or produce energy, including the direct or indirect use of tax-exempt bonds for providing funds under such a program. Subsidized financing does not include, however, loan guarantees.

This rule replaces the current law which permits a 5% energy credit for IDB financed property and a 10% credit for other government subsidized financing. It is generally effective for periods after December 31, 1982. However, in the case of property

which is allowed the energy percentage for the first time under the Act (e.g., co-generation and RDF storage property), this rule will apply to periods after December 31, 1979. Accordingly, investments made prior to 1983 in property which is part of a resource recovery facility financed with tax-exempt IDBs will, in general, remain eligible for a 5% energy credit.

Depreciation

Section 167 of the Internal Revenue Code provides for the allowance of a depreciation deduction for the wear and tear and obsolescence of property used in the trade or business of the owner of the property. At the election of the taxpayer and provided the original use of the property commences with the owner, the allowance may be computed on the basis of class lives provided pursuant to Regulations issued by the Treasury. The class life system is designed to minimize disputes between taxpayers and the IRS as to useful life of property, salvage value, repairs and other matters. In April, 1979, a new set of class lives was established for assets used in waste reduction and resource recovery plants. The asset guideline period established for such class is 12 years: the lower limit in the range is eight years and the upper limit, 12 years. The class, while covering most equipment in a resource recovery facility, does not include any package boilers or electric generators and related assets. The net affect of such accelerated depreciation is to improve the cash flow situation of the owner during the early years of a project when operational problems may be most pronounced.

Interest Deductions

Depending on how the various agreements between project parties are structured, the taxpayer may deduct the interest portion of lease payments from book income or may charge the full rental payment to expense in the period incurred.

Table 1
After-Tax Benefits of Private Ownership
Capital Cost = \$10,000,000

Year	Investment ¹ Tax Credit	Energy ² Tax Credit	Depreciation ³	Interest ⁴	Total After- Tax Benefits	Net Present Value
1	\$900,000	\$450,000	\$1,150,000.00	\$ 414,000	\$2,914,000	\$2,601,785.7
2			862,500.00	399,924	1,262,424	1,006,396.7
3			646,875.00	384,606	1,031,481	734,187.3
4			485,156.25	367,839	852,995.25	542,093.7
5			363,867.19	349,623	713,490.19	404,853.5
6			272,900.39	329,751	602,651.39	305,321.9
7			204,675.29	308,016	512,691.29	221,915.3
8	<hr/> <u>\$900,000</u>	<hr/> <u>\$450,000</u>	<hr/> <u>153,506.47</u>	<hr/> <u>284,418</u>	<hr/> <u>437,924.27</u>	<hr/> <u>176,370.3</u>
			\$4,139,430.60	\$2,838,177	\$8,327,657.60	\$6,003,425.40

1. Assumes 10% ITC is available on 90% of the facility
2. Assumes 5% energy tax credit is available on 90% of the facility
3. Assumes 8 year depreciation period, double declining balance method
4. Assumes 15 year level debt amortization @ 9% per year
5. Assumes 12% discount rate to calculate net present value

2.2.1.5 Leveraged Leasing

A leveraged lease is a form of project financing that involves the leveraging of an equity investor's funds and the pass-through to the user/lessee, in the form of lower lease rentals, of the tax benefits inherent in the ownership of the project. An economic prerequisite usually is that the tax benefits of ownership can be utilized more effectively by the equity investor, as owner/lessor, than by the user/lessee. Principal among such tax benefits are the investment tax credit and deductions for accelerated depreciation and interest.

In the event the user/lessee is able to take full advantage of the tax benefits of ownership, there may be little economic justification for engaging in leveraged leasing. The determination of whether or not the user/lessee can fully utilize the tax benefits requires a careful review of its estimated tax liabilities over the period during which these tax benefits would be available.

Leveraged leasing can be used for the financing of virtually any kind of property except non-depreciable land and certain types of property which the Internal Revenue Service considers "limited use property" (*i.e.*, property which will probably be of little or no use to potential lessees or buyers, other than the lessee or its affiliates, at the end of the lease term). Examples of "limited use property" are described in IRS Revenue Procedure 76-30, issued on August 19, 1976.

In leveraged leasing, equity investors acquire the project to be leased prior to its in-service date for tax purposes through a specially-created ownership trust or partnership. Their investment must be at least 20 percent of the cost of the project. The balance of the cost of the project may be raised through industrial development bonds or it can be

obtained from the issuance by the trust or partnership of its long-term obligations. The debt financing is without recourse to the equity investors obligations and is secured only by an interest in the project assets and an assignment of the lease. The equity participants' return on investment is derived from (a) the net cash flow available from lease rentals in excess of debt service, (b) the tax benefits of ownership and (c) the residual value of the project.

The institutions providing the debt portion of the financing look primarily to the ability of the lessee to make timely rental payments and to the collateral value of the project. Of course, the lenders have a claim on lease rentals prior to that of the equity participants.

Since it is essential to a leverage lease financing that the tax benefits of ownership inure to the lessor, it is often necessary to obtain from the IRS a private ruling letter stating that the transaction qualifies as a "true" lease and that the lessor will be deemed the owner of the property for Federal income tax purposes. With the publication on April 11, 1975 of Revenue Procedure 75-21, the IRS set forth its guidelines for the issuance of advance rulings in leveraged lease transactions. Among other conditions, the guidelines require:

- (a) an initial equity investment in the project by the lessor equal to at least 20% of the cost of the project; maintenance of the 20% investment throughout the lease term; a reasonable estimated residual value of the project, exclusive of any allowance for inflation or deflation, of at least 20% of original cost; and a reasonably estimated useful life remaining at the expiration of the lease term equal to the longer of one year or 20% of the originally estimated useful life;

- (b) no contractual right of the lessee or a related party to purchase the project or renew the lease at a price less than fair market value;
- (c) no contribution by the lessee or a related party to the cost of the project except for ordinary maintenance or repair and improvements or additions owned by the lessee or a related party and readily removable without material damage to the project;
- (d) no lending by the lessee or a related party of any funds necessary to acquire the project and no guarantee by the lessee or a related party of indebtedness created in connection with the acquisition of the project by the lessor; and
- (e) demonstration by the lessor that it expects to receive a profit from the transaction apart from the value of the tax benefits.

There are a number of other conditions set forth in Revenue Procedure 75-21 relating to "puts", uneven rental payments and "unwinds" which should be carefully reviewed in structuring a leveraged lease transaction. In addition, a number of requirements for information and representations in the preparation of advance ruling requests were set forth on May 5, 1975 in Revenue Procedure 75-28. While the Revenue Procedures have had the effect of imposing more stringent requirements for the receipt of advance rulings in leveraged lease transactions, they also have cleared away most of the uncertainty which previously existed and have made it possible for many leveraged lease financings to proceed in a more orderly fashion and without the necessity of applying for an advance ruling.

Leveraged leasing can produce significant savings in financing costs whenever the user cannot fully utilize the tax benefits associated with the

project. This may occur because of substantial investment tax credits or reduced tax liabilities resulting from special deductions or net operating loss carry forwards. When this situation exists, the lessee may gain more from the reduction in financing costs than will be lost through passing the tax benefits through to the lessor.

2.3 Preliminary Financing Strategy

As presently envisioned, the proposed Solid Waste Management Center would comprise a transfer station as well as a waste processing and energy recovery system. In developing a preliminary financing strategy for the Center, the following basic assumptions have been made based on discussions with the City and its engineering consultants:

1. Ownership of the transfer station portion of the Center will rest with the City;
2. The resource recovery portion of the Center will be owned by private industry; and
3. A full service contractor will be selected to engineer, design, construct, start-up, and operate for an extended period both portions of the Center.

The expressed desire to split-up the ownership of the Center creates certain difficulties which must be resolved prior to securing long term financing. Among these are:

1. The need to define specific physical boundaries of the transfer station and resource recovery portions of the Center to ensure that costs are properly allocated between the two;
2. The actual allocation of costs of equipment at the Center which serves both a transfer and processing function to either the transfer station or resource recovery portion of the Center;
3. The need to sell or lease the land on which the resource recovery system will be located in order to achieve private ownership. Currently, the City owns the site on

- which both the transfer station and resource recovery system will be situated. In order for the City to dispose of property, the property must be declared surplus and must be sold or leased at competitive bidding;
4. The need to determine how property taxes would be assessed against the Center. If it is determined that the transfer station is of direct benefit to the resource recovery system, possessory interest taxes may be assessed against the resource recovery system which would include taxes assessed on the transfer station;
 5. The need to develop an insurance program for the Center which takes into consideration the possibility that a breakdown or total destruction of one portion could affect the other portion; and
 6. The need to develop a procurement procedure which accommodates public bidding requirements and at the same time permits a full service contractor to exercise "designers' preference."

While none of these issues is insurmountable, additional work is required to permit their early resolution.

Of the various tax-exempt debt financing alternatives reviewed earlier, the use of lease revenue bonds appears to provide the most desirable option for financing the transfer station portion of the Center. The bonds would be issued either by a JPA or by a non profit corporation and the City would act as lessee of the project. Issuance of the bonds would not be subject to voter approval and lease payments

made by the City would not be considered debt counting against its statutory debt limit. Use of lease revenue bond financing would result in lower interest rates and costs of disposal than use of traditional revenue bond financing since a) the City's obligation to make lease payments in amounts sufficient to cover debt service on the bonds would add credit support to the financing and enable the issue to obtain a rating about one level lower than the City's G.O. bond rating, and b) annual payments would not have to include the coverage factor typically required in a straight revenue bond financing.

Under the lease revenue bond option, the City would make annual payments equal to principal of and interest on the bonds. The source of such payments could be the collection charges assessed to homeowners for refuse pickup and disposal as well as tipping fees (which would be set by the City) imposed on private haulers using the facility. Both collection charges and tipping fees would be set at levels necessary not only to make the lease payments but also to pay for the operation of the transfer station portion of the Center.

Use of a JPA as the lessor is probably the cheaper alternative because a JPA would not have to pay possessory interest taxes. However, use of the JPA would require some financial and other involvement by the lessor entity and this would not be obtained if the transfer station were to serve only the City of Berkeley. In addition, use of a JPA would require various procedural and other approvals which could be time consuming.

An alternative to the lease revenue bond financing of the transfer station would be to utilize moneys available in the City's Refuse Disposal and Development Fund. This Fund has been built up by assessing

a 25% surcharge on the collection rate. It is our understanding that as of March 1980, there is about \$1.7 million already in the Fund and revenues of about \$709,000 are estimated for fiscal year 1980-81. As the transfer station portion of the Center is expected to cost only \$3-\$4 million, the balance of this cost could be obtained in 2 to 3 years given current collection rates, and the transfer station could be financed outright without the need for a bond issue. Operating and maintenance costs of the transfer station would be paid from collection rates imposed on homeowners and tipping fees assessed to private haulers.

The only viable financing alternative for private sector ownership of the resource recovery system appears to be industrial development bonds issued by the California Pollution Control Financing Authority. Bonds issued by CPCFA for a full service contractor would be secured by the contractor's guarantee of either lease or debt service payments and by a mortgage on the facility. The source of the contractor's payments would be tipping fees and revenues from the sale of energy. For the private sector to guarantee either lease payments or debt service, it would require that the City enter into a put or pay contract to provide a minimum quantity of solid waste and pay for the disposal of that waste regardless of whether or not the minimum quantity was actually delivered. Assuming that the resource recovery system were fully operational, the transfer station portion of the Center would serve as a delivery point only and operating costs would be kept to a minimum. Moneys collected to pay for operating costs of the transfer station (as discussed above) would be applied to the City's put or pay obligation. The City, however, would always have the ability to raise collection rates and tipping fees at the transfer station in order to meet its payment obligations to the full service contractor.

3.0 Impact of Financing Costs on Total Project Costs

The total cost of a project (i.e. the size of the bond issue) will obviously vary depending on the financing alternative ultimately selected. Sizing a bond issue is an involved process, the starting point of which is the determination of facility construction costs and any other costs (e.g. feasibility study costs, etc.) which may be recovered from the bond proceeds. To these costs must be added the costs of issuance, including for example, underwriter's fees, legal fees, printing costs and rating agency fees. In addition, in a revenue bond issue for a resource recovery project, it is customary to fund various reserves from the bond proceeds, most importantly a Debt Service Reserve Fund, typically in an amount equal to maximum annual debt service on the bonds. Debt service on the bond issue is a function of the interest rate at which the bonds are sold and the period of time over which the bonds are amortized. Amortization period is related to the expected useful life of the equipment. While refractory wall and waterwall furnace incinerators generally have expected useful lives of 20 years or more, little is known about the useful life of small scale modular systems or prefabricated units since such systems have not had a long operating history. In view of this, it may be prudent to assume a shorter useful life, on the order of 10-15 years, as opposed to 20 years for these types of systems.

A revenue bond issue must, in addition to the above, provide funds for capitalized interest, that is, to pay interest during the construction period when no revenues are generated. Capitalized interest is a function of the ultimate interest rate on the bonds and the period of construction.

A final series of adjustments to the bond issue size must be made to reflect interest earnings during the construction period on the debt service reserve fund, the amount of capitalized interest and the construction fund. These adjustments are a function of the reinvestment interest rate in the market and projected drawdown schedule on the construction fund.

Based upon the factors discussed above, the size of the bond issue can be derived. However, it is emphasized that many of these factors, including interest rates on the bonds, interest earnings available on investments, and drawdown schedule require information that can only be determined and brought together around the date of the bond sale. Past experience indicates that the construction cost of a project for a revenue bond issue may constitute 70% of the final issue size after allowing for reserve funds, issuance costs, capitalized interest, and other adjustments.

4.0 Federal Assistance Programs

The Federal government has developed and is implementing a number of programs for providing direct and indirect assistance to communities for planning and implementing solid waste disposal and resource recovery projects.

Direct Federal Grants for solid waste disposal and resource recovery will not approach the scale of the Federal grant program for waste water treatment projects. However, meaningful direct and indirect assistance is being made available to public bodies and private persons for planning, developing, and implementing resource recovery projects.

The table below provides a partial list of Federal Assistance Programs, both direct and indirect, available for solid waste disposal and recovery projects.

FEDERAL ASSISTANCE PROGRAMS FOR RESOURCE RECOVERY

<u>Agency</u>	<u>Title of Program</u>	<u>Eligible Candidate</u>	<u>Purpose</u>	<u>Funding Available</u>
Environmental Protection Agency	1) Urban Resource Recovery Grant Program (PL94-580)	Public	Seed Money	\$15 mm
	2) RCRA Funds (PL94-580)	State	Planning	
	3) RCRA Panels (PL94-580)	Public	Technical Assistance	
	4) 201 Grant (PL95-12)	Public	Sludge	Substantial Co-Financing

(Continued)

FEDERAL ASSISTANCE PROGRAMS FOR RESOURCE RECOVERY

<u>Agency</u>	<u>Title of Program</u>	<u>Eligible Candidate</u>	<u>Purpose</u>	<u>Funding Available</u>
Department of Energy Conservation and Solar Applications James Forrestal Building, 1000 Independence Avenue Attn: Ms. Maxine L. Saritz Washington, D.C.	1) Research Development Demonstration Grants (PL95-238) 2) Crude Oil Entitlements 3) Loan Guarantees (PL95-238) 4) Price Supports; Cooperative Agreements (PL95-238)	Public and Private Public and Private Public and Private Public and Private	Demonstration Credit for existing facilities on a \$/Btu Implementation Implementation	\$15 mm Expires 1982 \$300 mm \$2.2 Billion
Small Business Administration 1441 L St. N.W. Washington Pl. Administration: A. V. Weaver	Energy Loan Program Pollution Loan Program	Small Business	Solid Waste Disposal	\$5 mm Each Loan

Other Agencies with Assistance Programs

- 1) Housing and Urban Development
HUD Building
415 Seventh Street S.W.
Washington, D.D. 20410
Attn: Asst. Secretary for Community and Planning Development
- 2) Department of Commerce
Economic Development Administration
Main Commerce Building
Washington, D.C. 20238
Asst. Secretary Robert T. Hall

Environmental Protection Agency (EPA)

The EPA has been designated as the lead Federal Agency for providing technical and financial support to states and local government for planning solid waste disposal and resource recovery projects. In

addition, of course, the EPA is the agency establishing environmental regulations for landfill operations, air quality and water quality.

The EPA currently has four basic programs for providing assistance to states and communities for resource recovery projects:

1) Urban Resource Recovery Grant Program

The EPA has selected 63 projects (out of 200 applicants) throughout the country to provide seed money for planning resource recovery projects. The total budget in fiscal 1980 for these projects was \$15 million. There is no plan at this time to expand beyond the initial group. The program is run by the regional offices.

2) RCRA Funds for State Planning

Under subtitle D of the Solid Waste Disposal Act, the EPA provides grants to public agencies -- generally through state agencies for purposes of planning in the area of waste management and resource recovery. Appropriations in 1978 and 1979 were \$30MM and \$40MM respectively, but this program is expected to be phased out as state plans evolve. State and local government are expected to bear future costs.

3) Resource Recovery and Conservation Panels

The EPA has set up 10 regional panels of technical and financial experts to provide consulting assistance to communities developing resource recovery projects. While this program does not provide direct financial support, it does provide communities with access, on a limited basis, to qualified experts in the field as well as peer exchange programs.

4) Co-Disposal of Sludge (201 Grants)

Resource recovery projects which are considering co-disposal of municipal solid waste and sewage sludge can receive direct financial assistance in the form of grants from the EPA under Section 201 of

Clean Water Act (PL95-12). The EPA, under current guidelines, will provide to a resource recovery project up to 100% of the estimated cost of a facility which would be required to incinerate the sewage sludge alone. This program is monitored on a regional basis and to date has been used for 3 facilities. The State of Delaware project is the most recent example of how this funding was blended into a project.

Department of Energy (DOE)

The DOE has been designated as the lead Federal Agency in the demonstration and implementation of resource recovery projects particularly as it relates to the conversion of municipal waste to useful energy.

The DOE has had both a limited budget and limited authority to assist public and private entities in the development and implementation of resource recovery projects. New legislation and regulations now being developed potentially make the DOE a valuable source of direct and indirect economic support.

The DOE issued, on February 25, 1980, a program solicitation for proposals for cooperative agreements on alternative fuel production. This is funded in the amount of \$2.2 billion for fiscal 1980 but the availability of funds to resource recovery is yet to be defined. A major program solicitation is expected in late 1980.

1) Research, Development and Demonstration Goals

The DOE has available \$15 million in 1980 for funding projects which demonstrate new technology or institutional approaches to implementing resource recovery projects. DOE is currently funding 70 separate public and private projects, including 20 communities selected to conduct studies to demonstrate the feasibility of using waste to produce energy. New project funding is restricted in this program, which is currently monitored from the Washington, D.C. offices.

2) Crude Oil Entitlements Program

The DOE's Economic Regulatory Administration has granted automatic inclusion in its Crude Oil Entitlements Program to municipal solid waste, refuse derived fuels, and methane from landfills used for domestic fuels. While this program provides direct and substantial moneys to projects producing energy from waste, the effect of deregulation of crude oil prices will phase out the availability of these funds in 1981.

3) Loan Guarantees

The DOE has issued its final proposed regulations on the Loan Guarantee Program (Section 207(b) of the Department of Energy Act of 1978). The loan guarantee program is designed to provide Federal guarantees to support financial debt instruments issued for financing the construction of facilities which convert urban wastes to desirable forms of energy. This program will enable public and private entities to borrow at attractive interest rates for projects which might not be otherwise financeable.

The loan guarantee program, currently funded to \$300 million will be of limited use, but in certain critical cases (e.g. low credit standing of a community) could prove to be meaningful.

4) Price Supports

Proposed regulations have been issued on the DOE Price Support Programs. Under Section 20(b)(1) of the Federal Nonnuclear Energy Research and Development Act of 1974 (PL95-238 & PL93-577) the DOE is authorized to provide Federal financial assistance to selected municipalities in the form of grants, contracts, price supports, cooperative agreements or any combination thereof.

The price support is designed to provide short term (5 year) direct cash subsidies to projects which convert waste to energy on the basis of the type and quantity of energy produced.

While this program is currently limited in scope, the potential for funding is relatively large and could provide assistance necessary to make a project viable in its early years. Stronger price support legislation is currently being considered by Congress (S. 1934).

JANUARY 9, 1980

MEMORANDUM TO: Rene Rofe,
Blyth Eastman Paine Webber Incorporated

FROM: Robert P. Feyer
Orrick, Herrington, Rowley & Sutcliffe

RE: Effect of Proposition 4 on Proposed
Alternative Methods of Financing
Solid Waste Disposal Projects

You have requested our advice regarding the effect of the recently enacted amendment to the California Constitution imposing spending limits upon state and local government agencies ("Proposition 4") on different methods of financing a solid waste resource recovery facility. Reference is made to your analysis, prepared for the North Santa Clara County Municipal Solid Waste Management Project, outlining six different methods of financing. This memorandum will assume basic understanding of the provisions of Proposition 4. As you are also aware, the provisions of Proposition 4 are in many respects confusing and ambiguous, and many questions concerning the impact of the measure will remain uncertain until they have been clarified by legislation or court decisions.

1. General Obligation Bonds -- Under Proposi-

tion 4, debt service on any general obligation bonds, even those issued after the July 1, 1980 effective date of Proposition 4 will be excluded from the "appropriations limit" of the issuing entity. Sections 8(g) and 9(a) specifically provide such an exclusion in the case of bonds which have been approved by the voters, as any general obligation bonds would have to be. Of course, you are aware that no local government is presently authorized to issue general obligation bonds because of Proposition 13, but that may be changed by further constitutional amendment this year.

2. Revenue Bonds -- It is our opinion that debt service on revenue bonds of the type authorized by the 1941 Revenue Bond Law will be excluded from any "appropriations limit" under Proposition 4. Proposition 4 only limits the appropriation of moneys which are "proceeds of taxes." The term "proceeds of taxes" is defined to include "user charges... to the extent that such proceeds exceed the costs reasonably borne by [the issuing entity] in providing the... product or service... ." It is our opinion, which is widely shared by those who have analyzed Proposition 4, that the costs of amortizing debt which provides capital facilities necessary for a governmental service constitute a "cost reasonably borne" for

the purpose of providing such service. We believe user charges for a solid waste resource recovery facility may be set at a level sufficient to pay debt service and operation and maintenance costs of the enterprise.

It is less clear to us whether, consistent with Proposition 4, a government entity which issues revenue bonds for a resource recovery project can levy rates and charges which pay not only debt service, but also an additional "coverage factor." This issue will probably have to be addressed in legislation. However, my preliminary analysis is that there is good reason to believe that a "coverage factor" can be collected without adverse impact from Proposition 4. In part, the answer to this question depends upon how the coverage moneys are used. If the coverage moneys are, pursuant to the bond resolution, restricted for use to other expenses of the project (such as capital improvements, operational costs, or early retirement of bonds), there is a strong argument that this use of funds is also reasonably related to the cost of providing the service. The area where I see potential problems would be if the coverage moneys could, under the bond resolution, be transferred into the general fund of the issuing entity, where they might be restricted by the "appropriations limit" of that entity.

3. Lease Revenue Bonds -- In this situation, it is necessary to consider the impact of Proposition 4 at the level of two entities: the issuer of the bonds, and the lessee. As to the issuer, we believe it most likely that there will be no Proposition 4 impact. The receipt of lease payments from the lessee is most likely not includable as "proceeds of taxes." At the level of the lessee entity, it seems most likely that payment of the lease rentals to the lessor entity will have to be funded from within the lessee's "appropriations limit" if lease payments are derived from "proceeds of taxes." This means that the lessee entity could use revenues from operation of the resource recovery facility to pay rentals, without a charge against its "appropriations limit," but use of tax revenues for that purpose would be charge against the "appropriations limit."

4. Joint Powers Authority Bonds -- Bonds issued by a joint powers authority will fall into one of the two categories of revenue bonds discussed above.

5. Special District Bonds -- Bonds of a special district will fall into one of the three categories of bonds discussed above.

6. California Pollution Control Financing Authority Bonds -- Since these bonds do not involve any pay-

ments derived from taxation, it is our opinion that they will not be impacted by Proposition 4.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE
COUNSELORS AND ATTORNEYS AT LAW

"CABLE ORRICK"
TELE 34-0973

ERIC SUTCLIFFE
WALTER G. OLSON
WILLIAM D. WEEKE
SIDNEY E. ROBERTS
JAMES H. BENNETT
C. RICHARD WALKER
JAMES F. CRAFTS, JR.
JAMES K. MAYNES
RICHARD C. SALLADIN
RICHARD J. LUCAS
CARLO S. FOWLER
DONALD A. SCHUTTER
PAUL A. WEBBER
JAMES R. MADISON
BILLMAN C. RIMSELL, JR.
WILLIAM L. HOISINGTON
THOMAS R. SHEARER, JR.
CAMERON W. WOLFE, JR.
RALPH C. WALKER
M. PETER LILLEYAND
WILLIAM E. DONOVAN
ROBERT J. GLOSTEIN

W. REECE BADER
PAUL J. SAX
MARYELLEN B. CATTANI
WILLIAM L. RILEY
E. THOMAS UNTERMAN
EDWARD J. ROGIN
JACK E. FERGUSON
ALVIN W. FARGO III
JACK B. OWENS
WILLIAM F. ALDERMAN
RICHARD E. V. HARRIS
G. KIP EDWARDS
RAYMOND G. ELLIS
STEVEN A. BRICA
JOHN F. SEEGAL
ROBERT P. FEYER
NORMAN C. MILE
TOWER C. SNOW, JR.
ROGER L. DAVIS
ALAN R. AUSTIN
RALPH H. BAXTER, JR.

ELEVENTH FLOOR
600 MONTGOMERY STREET
SAN FRANCISCO, CALIFORNIA 94111
TELEPHONE (415) 392-1122

April 18, 1980

Terrence E. Comerford
Blyth, Eastman, Dillon & Co.
555 California Street
43rd Floor
San Francisco, California 94120

Re: Berkeley Resource Recovery Center

Dear Terry:

One question left open from Rene Rofe's draft of your report on financing alternatives was whether, if the Resource Recovery Center is privately owned, the City of Berkeley could enter into a "put or pay" contract with the Center. We have researched this question in terms of the Constitutional prohibition against cities incurring indebtedness without a vote, and have included that a "put or pay" contract for solid waste would not cause any significant legal problem.

There is ample authority in California that a contract entered into by a city which has a contingency, which might cause the city to have to pay money, does not make the contract an illegal "indebtedness" at the outset. If the contingency arises in the future (i.e., Berkeley is unable or unwilling to deliver the required quantities of solid waste to the Center), the nature of the City's obligation would then be reviewed. There would be no illegal indebtedness so long as the City had adequate revenues each year to pay the penalties under the "put or pay" contract. On a year to year basis, this will probably not be an undue fiscal burden. Like a lease, the obligation under the "put or pay" contract would arise from time to time, and hence the failure of the city to deliver solid waste in one month or one year should not result in incurring an "indebtedness" which extends beyond that year. Finally, another way to completely avoid any question of the "put or pay" contract being an illegal indebtedness would be for the contract to provide that the city is only obligated to pay penalties from its solid waste collection fees. If the City's General Fund is thus not liable for the penalties, the "special fund" doctrine will totally exclude this contract from any consideration as a Constitutional "indebtedness."

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

Terrence E. Comerford
April 18, 1980
Page Two

Please feel free to call me if you have any further questions on this subject. We have a lengthier memorandum analyzing this question, but I did not think it would be necessary for your immediate purposes. However, I will be glad to furnish it to you if you are interested.

Sincerely,

Robert P. Feyer

RPF:ca

✓cc: Rene Rofe

APRIL 7, 1980

MEMORANDUM TO TERRY COMERFORD

Re: Report on Financing Berkeley Solid
Waste Center

During our meeting last week, I agreed to review a few questions arising from Rene Rofe's draft of a report to the City of Berkeley on alternative methods of financing the proposed Solid Waste Management Center. Attached with this memorandum is a copy of Rene's report, with a number of suggestions marked directly on the copy. Included are several suggested inserts on matters which we discussed last week.

The following are some additional remarks on some questions we discussed:

1. Industrial Development Bond Question --

As I suggested to you last week, Internal Revenue Service regulations appear to provide that, if certain conditions are met, the proposed bonds to finance the Berkeley Solid Waste Management Center will be industrial development bonds, even if ownership of the project will remain with the City, as would be the case in the issuance of tradi-

tional revenue bonds or general obligation bonds. This result will obtain if the following two conditions are met: (a) The City enters into a contract with PG&E to take, or to take or pay for, more than 25% of the electricity generated by the facility, and (b) the payment from PG&E will exceed 25% of the total debt service with respect to the bonds. See IRS Regulation §1.103-7(b)(5). As I indicated also last week, the treatment of the bonds as industrial development bonds should have little impact on their legality and marketability, since the facilities to be acquired should qualify as exempt "solid waste disposal facilities" under Section 103(b)(4)(E), so long as the electric generation facilities can be financed from the City's own accumulated funds or the 10% "in substantial portion" of the bond issue. The only negative factors in IDB treatment are the applicability of the "substantial user" and "related persons" exception to the tax opinion, and restrictions on refunding. Also, although not too likely at present, it is possible that in the several years before such bonds will be issued, IRS may succeed in amending its regulations defining a "solid waste disposal facility" to eliminate the ability to finance facilities which produce valuable byproducts.

2. AB 3210 -- I have reviewed the legislation

which you showed me last week, AB 3210 (Calvo). If this legislation passes, its impact will be as follows. Current law authorizes joint powers authority to issue revenue bonds under certain circumstances without approval of the voters of the affected communities, and subject only to the traditional JPA procedures for approval by the governing bodies of the constituent entities of the JPA. Government Code §6546. As this section is presently written, the types of facilities which a JPA may finance with revenue bonds does not include facilities for solid waste disposal or energy conversion. AB 3210 would add such facilities to the list which may be financed by JPAs with revenue bonds not requiring voter approval. Note that such revenue bonds are subject to referendum proceedings in each jurisdiction as to the ordinance by the governing body approving the issuance of the revenue bonds.

Another provision in current law permits negotiated sales, and sale at less than par, of revenue bonds issued by a JPA for an electric energy project. AB 3210 would also permit revenue bonds issued for solid waste disposal projects to be sold at negotiated sales and below par.

The proposed amendments made by AB 3210 are in addition to the present provisions of the JPA Act which

permit a JPA to issue 1941 Act revenue bonds to finance solid waste disposal facilities (Government Code §6579.5).

3. Proposition 4 Impact -- I mentioned to you last week that I had once before prepared a memorandum for Rene Rofe explaining the impact of the Proposition 4 spending limitations on different types of bonds that were being contemplated for a solid waste disposal facility in North Santa Clara County. I have attached to this memorandum a copy of my earlier memorandum to Rene on the subject. I suggest that this information be incorporated in the report.

4. Put or Pay Contract -- We are still continuing research on the question of the legality of the City of Berkeley entering into a "put or pay" contract to deliver solid waste to a private operator of the Solid Waste Management Center.

Please feel free to call me if you have any further questions or comments on these materials.

Robert P. Feyer

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

COUNSELORS AND ATTORNEYS AT LAW

ELEVENTH FLOOR

600 MONTGOMERY STREET

SAN FRANCISCO, CALIFORNIA 94111

CABLE "ORRICK"
TELEX 34-0973

TELEPHONE 392-1122
AREA CODE 415

April 11, 1980

M E M O R A N D U M

Re: Crude Oil Windfall Profit Tax Act

The Crude Oil Windfall Profit Tax Act (the "Act") was signed by President Carter on April 2, 1980. Among its many provisions are certain amendments to Section 103 of the Internal Revenue Code of 1954, as amended (the "Code"), to expand the types of facilities which may be financed with tax-exempt industrial development bonds and amendments to Section 48 of the Code to provide tax credits for certain energy-related property, limited to the extent such property is not financed with the proceeds of tax-exempt obligations.

All of the industrial development bond ("IDB") provisions of the Act were contained in the Senate amendments and subsequently were modified in conference. As a result, the Senate amendment permitting the issuance of tax-exempt IDBs for "cogeneration property" was omitted in its entirety. The Act which emerged from conference

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

retained the Senate amendments relating to solid waste disposal facilities and hydroelectric generating facilities, but the scope of both provisions was substantially reduced. Specifically, the Act deletes a provision in the Senate amendment which would have permitted certain solid waste disposal facilities owned and operated by a governmental unit to produce electrical energy for sale to any person. The Act also omits a provision of the Senate amendment which included pumped storage projects, dams under construction and new dams within the types of hydroelectric facilities financeable with IDBs.

The remainder of this memorandum consists of a summary of the relevant IDB and tax credit provisions of the Act as outlined below:

I. Solid Waste Disposal Facilities
Producing Steam or Alcohol Fuel

II. Hydroelectric Generating Facilities

III. Renewable Energy Property

IV. Limitations with Respect to the
Issuance of IDBs

V. Tax Credits

I. SOLID WASTE DISPOSAL FACILITIES
PRODUCING STEAM OR ALCOHOL FUEL

Section 103(b)(4)(E) of the Code exempts "solid waste disposal facilities" from the general rule that the interest on industrial development bonds issued by a pub-

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

lic entity is not exempt from taxation. Section 241(a) of the Act adds a new subsection 103(g) which provides that "qualified steam-generating facilities" and "qualified alcohol-producing facilities" are to be included within the meaning of the term "solid waste disposal facility" for the purposes of Section 103(b)(4)(E). This amendment applies to obligations issued after October 18, 1979.

A. Steam-Generating Facilities

To meet the definition of a "qualified steam-generating facility"^{1/} under Section 241(a)(2) of the Act, (1) more than half of the fuel (determined on a Btu basis) utilized to generate steam must be solid waste or fuel derived from solid waste, (2) substantially all of the solid waste-derived fuel must be produced at a facility located at or adjacent to such steam-generating facility and (3) such production facility must be owned^{2/} and operated by the person who owns and operates the steam-generating plant.

If both the facility which produces the solid waste derived fuel and the steam-generating facility are

-
- 1/ A steam-generating facility, according to the Joint Explanatory Statement of the Committee of Conference (the "Report"), includes "incinerators, boilers, smokestacks and precipitators and other property used in the generation of steam," but does not include "property used in the transmission of steam."
 - 2/ The Report indicates that the Conferees intended that any requirement that a particular person own the facility to qualify it as a solid waste disposal facility means ownership for tax purposes.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

owned and operated by or for a state or a political subdivision thereof, the two facilities need not be located on the same or an adjacent site. Under Section 1.103-7 (b) (5) of the current IRS regulations, tax-exempt obligations which finance government-owned facilities which sell a major portion of their output (e.g., electricity or steam) to private entities pursuant to an output contract may be IDBs. The special rule for government-owned facilities appearing at Section 241(a)(4) of the Act permits a governmental unit to finance a facility within its boundaries and sell the steam or energy output to a private entity, without regard to the location of its solid waste facility. This could present a significant advantage since the generating facility could be located near the purchaser of the steam or electricity.

To take advantage of this special rule, however, substantially all of the solid waste used to produce the solid waste derived fuel at the solid waste disposal facility must be collected from the area in which the generating facility is located. For example, if a county solid waste authority owns and operates a generating facility, substantially all the solid waste processed at the facility which produces the solid waste fuel must be collected from within the county in which the

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

generating facility is located.

B. Alcohol-Producing Facilities

The requirements for a "qualified alcohol-producing facility" ^{3/} are similar to those for a "qualified steam-generating facility." Section 241(a)(3) of the Act sets the following requirements for a "qualified alcohol-producing facility": (1) the primary product of the facility must be alcohol; (2) more than half of the feedstock ^{4/} utilized to produce the alcohol must be solid waste or feedstock derived from solid waste; and (3) substantially all of the solid waste derived feedstock utilized to produce alcohol must be produced at a facility which is located at or adjacent to the site of the alcohol-producing facility and which is owned and operated by the person who owns and operates such production facility.

The Act does not contain a special location rule

3/ An alcohol-producing facility, according to the Report, includes "property required to convert cellulose fiber into sugar and property required in the fermentation of the sugar whether those procedures occur in one or more steps," and also includes "property used in the distillation of the fermented solution."

4/ While the Act does not specify how "half of the feedstock" is measured, the Report indicates that this determination should be made on a "reasonable basis, e.g., sugar content."

with respect to facilities owned by a governmental unit for alcohol-producing facilities similar to the special rule for steam-generating facilities. The Act does contain a special location rule for certain alcohol-producing facilities, but we understand that this rule applies to an existing project in Wisconsin. Since the requirements are very specific, it is doubtful that the rule has any general applicability.

5/ C. Solid Waste-Energy Producing Facilities

Section 241(b) of the Act permits certain additional "solid waste-energy producing facilities" to be treated as "solid waste disposal facilities" under Sec-

-
- 5/ Section 241(c) of the Act establishes this special rule for certain alcohol-producing facilities. Upon satisfaction of the requirements of this rule, the two facilities need not be located on the same or adjacent sites. To qualify as an alcohol-producing facility under this special rule, the facility must comply with (1) and (2) above and (a) substantially all of the solid waste derived feedstock must be produced at a facility which (i) went into production in 1977, (ii) is located within the limits of a city, and (iii) is located in the same metropolitan area as the alcohol-producing facility; and (b) before March 1, 1980, there were negotiations between a governmental body and an organization described in Section 501(c)(3) of the Code with respect to the utilization of a special process for the production of alcohol at such facility. The Act places a \$30 million limit on the aggregate amount of obligations which may be issued to finance any project under this special rule. In addition, the special rule terminates as to obligations issued after December 31, 1985.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

tion 103(b)(4)(E) of the Code if the obligations to finance such facilities are issued by an authority for two or more political subdivisions of a state. "Solid waste-energy producing facilities" are any solid waste disposal facilities and any facilities for the production of steam and electrical energy if (1) substantially all of the fuel used to produce steam and electrical energy is derived from solid waste from such solid waste facility; (2) both facilities are owned and operated by the authority described above; and (3) all of the electrical energy and steam produced by the facility which is not used by such facility is sold to an agency or instrumentality of the United States. It is our understanding that this provision was included to cover an existing project in Norfolk, Virginia. It is possible, however, that this provision could have somewhat broader application since the requirements are fairly general.

D. The Act and Existing IRS Regulations

The Act liberalizes in several respects the prior regulatory restrictions on the use of solid waste to produce a saleable energy product. First, steam and alcohol may now be produced from solid waste-derived fuel as well as directly from solid waste. Under existing regulations, there was uncertainty whether a boiler which

burned solid waste-derived fuel qualified as a "solid waste disposal facility" because the fuel at that point arguably had value. Secondly, it appears that only 51% (more than half) of solid waste or solid waste derived fuel need be used in the production of the steam or alcohol; such solid waste fuel may be combined with 49% of other fuel. Under the current IRS regulations, 65% of the material used to produce a saleable product must be solid waste. It is difficult to compare the two requirements, however. Under current regulations, the measure of the 65% requirement is weight or volume. Under the Act, the measure for "more than half" is Btus for a "qualified steam-generating facility" and the Report indicates that the measure of this requirement for a "qualified alcohol-producing facility" is "a reasonable basis, e.g., sugar content." The most advantageous measure of solid waste, then, may continue to be 65% by weight or volume, depending on the content of the solid waste.

An additional consideration with respect to this percentage requirement is the form of obligation which can be issued. Since the Act requires that obligations issued thereunder be issued only in registered form (see Part IV below), an issuer might prefer to rely on the 65% rule and the existing regulations to avoid this restriction.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

tion. It is important to keep in mind, however, that an issuer only has this option if the facility utilizes solid waste directly so as to qualify under current IRS regulations.

The Report provides a useful piece of ammunition to opponents of certain changes in the regulations with respect to solid waste disposal facilities. These proposed regulations, which have been drafted by the I.R.S. and have been under review by the Department of a Treasury for over a year, would add an economic benefit allocation to obligations issued to finance solid waste disposal facilities similar to the allocation formula in the regulations with respect to pollution control facilities.^{6/}

The Report includes the following language:

The conferees also want to make clear that the amount of solid waste disposal facilities that can be financed by tax-exempt IDBs under the provisions of this bill or under present law is not to be reduced by the value of any product created by solid waste disposal facilities. (Emphasis added.)

II. HYDROELECTRIC GENERATING FACILITIES

Section 242 of the Act amends Section 103(b)(4) of the Code (which generally lists the "exempt facilities") to add a new subparagraph (H), permitting the issuance of

6/ No such allocation is now required. Temp. Reg. §17.1.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

tax-exempt industrial development bonds to finance "qualified hydroelectric generating facilities." The Act defines a "qualified hydroelectric generating facility" as such property owned^{7/} by a state, political subdivision thereof or any agency or instrumentality of one of the foregoing and otherwise satisfying the definition of "qualified hydroelectric generating property" appearing at Section 48(l) (13) of the Code. That section requires that the property (1) be located on a site (a) at which there is a dam the construction of which was completed before October 18, 1979 and which was not significantly enlarged after such date,^{8/} or (b) at which electricity is to be generated without any dam or other impoundment of water^{9/} and (2) have an installed capacity of less than 125 megawatts. In addition

-
- 7/ The Report states that the public entity must own the hydroelectric facility for tax purposes to qualify as a facility which may be financed with tax-exempt obligations.
 - 8/ Section 242(a)(2) of the Act adds an additional requirement with respect to dams which are "qualified hydroelectric generating property" under Section 48(l)(13) of the Code. Such dam must be owned by a governmental body described above as of October 18, 1979 and the public entity must continue to own the facility as long as the tax-exempt obligations are outstanding.
 - 9/ The Report states that this provision of the Act does not apply to pumped storage facilities, ocean thermal facilities or ocean tidal facilities. It does state, however, that "qualified hydroelectric generating facilities" are those located on "a natural watercourse or constructed water flow and which generate electricity from the flow or fall of water."

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

tion, such property must consist of equipment increasing the facility's capacity to generate electricity by water (not including the transmission of electricity) and structures housing such generating equipment; fish passageways and dam rehabilitation property required because of the installation of equipment to increase the facility's generating capacity.

Section 242(a)(2) of the Act imposes a limitation on the financing of facilities where the installed capacity exceeds 25 megawatts (but is less than the upper limit of 125 megawatts). The proceeds of any issue of obligations to finance a hydroelectric facility otherwise qualifying under the Act cannot exceed (by more than an insubstantial amount):

10/
(the eligible cost
of facilities to be
financed)

25 (reduced by 1 for each megawatt by which the installed capacity exceeds 100 megawatts)
the number of megawatts (not in excess of 100) of the facility's installed capacity^{11/}

10/ Eligible cost is the cost to the governmental body attributable to periods after October 18, 1979 and before 1986. However, if an application has been docketed with the Federal Energy Regulatory Commission before January 1, 1986, the period during which costs may be incurred continues until 1989.

11/ The term "installed capacity" means the installed capacity of all electrical generating equipment placed in service at the site, including the capacity of equipment installed during the three taxable years following the taxable year in which the equipment financed is placed in service. (Section 48(l)(13(E) of the Code, as amended by Section 222 of the Act.)

Therefore, if a facility has an installed capacity of not more than 25 megawatts, the whole cost can be financed with tax-exempt IDBs; if the installed capacity is 50 megawatts, one half of the facility can be so financed; and if the capacity is 100 megawatts, one quarter of the costs can be financed with such obligations. In addition, for purposes of this limitation, all outstanding prior issues (excluding those to be refinanced) the proceeds of which are used to finance the same facilities must be aggregated, even if the issuers are different.

The Act contains a special rule which permits the financing of certain otherwise qualified hydroelectric generating facilities the installed capacity of which exceeds 125 megawatts. The Report indicates that the complicated and detailed provisions of this exception to the general rule apply to two existing dams in Grant County, Washington which have installed capacities of more than 125 megawatts.

III. RENEWABLE ENERGY PROPERTY

Section 243 of the Act creates a special exception to Section 103(b) of the Code for state obligations issued to finance certain "renewable energy" property with general obligation bonds if taxes are required to be levied in amounts sufficient to pay the principal and

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

interest on such obligations. Various additional specific limitations are imposed. It is our understanding that this exception was created to cover a program in the State of Oregon. Because the Act requires that such obligations be issued pursuant to a program established by a constitutional amendment before October 18, 1979, this provision is not generally applicable.

IV. LIMITATIONS WITH RESPECT TO THE ISSUANCE OF IDBS

The Act requires that obligations issued to finance "qualified steam-generating facilities," "qualified alcohol-producing facilities," "solid waste and energy-producing facilities," "renewal energy property" and "hydroelectric facilities" be issued only in registered form. The Act also denies the benefits of Section 103 to any obligation issued to finance such facilities if the payment of principal and interest is guaranteed by a federal program the principal purpose of which is to encourage the production or conservation of energy or if such payment is made in whole or in part with funds provided under such a federal or state program. The Department of Energy ("DOE"), for example, makes grants, and guarantees loans with respect to various energy conservation programs and programs to develop alternative energy sources. Projects receiving benefits of such programs cannot be financed with tax-exempt IDBs.

V. TAX CREDITS

In addition to provisions expanding the use of tax-exempt financing for the construction of certain energy-related facilities, the Act contains amendments to sections 46 and 48 of the Code relating to business energy investment tax credits which create, modify or increase tax credits for equipment that produces alternative forms of fuel to generate energy. The Act also adds a new section 44D to the Code which allows a tax credit for producing fuel from nonconventional sources.

Section 222 of the Act expands the definition of certain kinds of property already eligible for energy credits under section 48(l) of the Code. These include "alternative energy property," "solar or wind energy property," and "specially defined energy property." In addition, section 222 adds to section 48(l) of the Code energy credits for "biomass property," "qualified hydroelectric generating property," "cogeneration property" and "qualified intercity buses." 11/

Some of these credits may be applicable to equipment of the type that qualifies for financing with the proceeds of tax-exempt obligations. Credits are available for biomass

11/ This memorandum will not give detailed descriptions of the property eligible for these credits. We will be happy to provide such descriptions upon request.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

property which could apply to certain alcohol-producing and steam-generating facilities using solid waste derived fuel. An alternative fuel production credit might also apply to such alcohol-producing facilities. In addition, facilities eligible for tax-credits (e.g., cogeneration facilities), but not eligible for tax-exempt financing as "exempt facilities" under Section 103(b)(4), may be financed with tax-exempt IDBs utilizing the "small issue" exemption appearing at Section 103(b)(6) of the Code.

The Act, however, restricts the use of these credits with respect to property financed with the proceeds of tax-exempt obligations. Section 221(b)(2) of the Act amends section 48(1)(ll) of the Code to reduce the energy credit by one-half when the property eligible for the tax credit is financed with tax-exempt obligations. (Prior to this amendment, the energy credit for such property was five percent, rather than the normal ten percent credit. The amendment was necessary because the Act provides different percentages of credit for various types of property.)

In addition, section 223(c) of the Act sets up a mechanism for phasing out energy credits entirely when the otherwise qualified property is financed with the proceeds of tax-exempt IDBs. With respect to property for which credits existed under prior law ("alternative

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

energy property," "solar or wind energy property," and "specially defined energy property"), no energy credits will be available for such property acquired after December 31, 1982 and wholly financed with the proceeds of tax-exempt IDBs. However, with respect to credits created by the Act ("qualified hydroelectric generating facilities," "cogeneration equipment," "qualified intercity buses," "ocean thermal property" and "expanded energy credit property), no such credit is available for property acquired after December 31, 1979 if such property is wholly financed with proceeds of tax-exempt IDBs.

Thus, because the use of tax-exempt financing fully or partially precludes utilizing these energy credits, an entity receiving the benefit of tax-exempt industrial development bonds must determine to what extent an energy credit is available and what effect tax-exempt financing has on utilizing the credit. Unless an issuer relies on the small issue exemption to issue tax-exempt IDBs to finance property which is also eligible for energy credits, an entity need only make this determination in a few cases:

1. Biomass Property - A ten percent credit is available for "biomass property" which is defined as, among other things, equipment which converts biomass to steam or alcohol. "Biomass" is generally defined as any organic

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

substance other than oil, natural gas or coal, or a product of oil or natural gas or coal. The Report states that biomass includes, among other things, waste, grain, wood, oceanic and terrestrial crops and crop residues. The Conferencees make it clear in the Report that this definition does not exclude municipal or industrial waste materials which contain processed products of oil, natural gas or coal such as "used plastic containers and asphalt shingles." The credit also applies to fuel or feedstock handling, storage and preparation equipment and pollution control equipment and equipment for storage of fuel derived from garbage at the site where such fuel is produced.

This credit would be available, then, to solid waste disposal facilities with steam or alcohol-producing capabilities. Such facilities can now be financed with the proceeds of tax-exempt bonds.

2. Alternative Fuel Production - Section 231 of the Act (which adds section 44D to the Code) provides a credit for the production of alternative fuels. Under this provision, a solid waste disposal facility which produces steam from solid agricultural byproducts (not including timber byproducts) is eligible to take a tax credit equal

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

to \$3 ^{12/} multiplied by the barrel-of-oil equivalent ^{13/} of the steam so produced which is sold by such facility to an unrelated person in a taxable year or used at the facility during such year.

The effect of tax-exempt financing with respect to this tax credit is slightly different from such effect with respect to energy credits. This credit is only reduced in proportion to federal, state or local grants, proceeds of tax-exempt obligations and subsidized energy financing used to construct or acquire the facilities or equipment. The credit is also reduced, however, dollar-for-dollar, in proportion to other energy investment credits allowed in connection with the property used to produce the steam.

It should be emphasized that because the provisions of the Act relating to the tax-exempt financing for hydroelectric generating facilities only apply to those facilities

^{12/} The Report states that "this provision is intended to provide producers of alternative fuels with protection against significant decreases in the average wellhead price for the uncontrolled domestic oil, with which alternative fuels frequently compete. The credit generally is to act only as a guaranteed price floor when the price of oil is in excess of \$29.50, but the credit would become available if, at any time prior to its expiration, the price of oil falls to below \$29.50, adjusted for inflation. Special rules are provided, however, for production of gas from Devonian shale, qualifying processed wood, and steam from solid agricultural byproducts to allow a credit when the price of oil is above \$29.50." Therefore, certain adjustments to this base \$3 are provided.

^{13/} The Report states that this \$3 credit is available for the production of each unit of 5.8 million Btus of energy.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

owned for tax purposes by a governmental entity, no energy credit is available to a private entity for facilities so financed. A private entity would only lose the benefits of energy credits if it were to construct or acquire hydroelectric generating facilities pursuant to a small issue exemption. Furthermore, because cogeneration facilities cannot be financed with the proceeds of tax-exempt bonds, except in reliance on the small issue exemption, the choice between energy credits and tax-exempt financing will present itself only under limited circumstances.

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

COUNSELORS AND ATTORNEYS AT LAW

ELEVENTH FLOOR

600 MONTGOMERY STREET

SAN FRANCISCO, CALIFORNIA 94111

TELEPHONE 392-1122
AREA CODE 415

CABLE "ORRICK"
TELEX 34-0973

April 15, 1980

M E M O R A N D U M

Re: Pending California Legislation
Regarding Industrial
Development Bonds

This memorandum is intended to report to interested persons on the current status of legislation pending before the California Legislature relating to industrial development bonds. It should be noted, as general background, that the Legislature this Spring will be increasingly preoccupied with budgetary matters, with particular emphasis on the potential impact of the Proposition 9 tax-cutting measure which will appear on the June 3, 1980 ballot.

Two bills have been pending in the Legislature since 1979 to authorize the issuance of industrial development bonds. AB 74 (Lockyer) would establish a state-wide Authority patterned on the existing California Pollution Control Financing Authority. SB 106 (Greene) would authorize the establishment of local industrial develop-

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

ment authorities to issue IDBs. Each of the foregoing bills has passed its house of origin and is pending in the opposite house. A number of parties are presently involved in negotiations on IDB legislation, including the two principal legislators, two separate offices of the Brown Administration, the California League of Cities, and private business groups. All these parties favor IDB legislation, but have different views on the details and structure of a desirable bill.

We understand that the principal areas of discussion now concern the scope of permissible IDB projects, and the question of whether IDBs should be partly or wholly "targeted" to urban or depressed areas. A compromise which has apparently gathered substantial support would permit, in effect, unlimited issuance of IDBs in "target" areas. In "non-target" areas, issuance would be limited in dollar amount (perhaps \$7 million) and by purpose (perhaps limited to industrial as contrasted with commercial facilities). There has also apparently been general agreement that IDBs would be issued by local authorities, rather than a single state authority, but there will be strong pressure to have a state-level review board to approve local authorities' bonds.

We are not aware of any strong opposition to

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

IDB legislation. However, until the various details are worked out, there is no assurance of passage of any bill. Among other things, it is still not clear which bill will be the vehicle for the ultimate compromise legislation. One possible problem is that legislative support for an IDB bill could evaporate if Proposition 9 passes (because of the revenue loss), not to mention the fact that the Legislature's attention would then be diverted from virtually all non-fiscal issues. Also, as occurred in 1978, there is the risk that an acceptable IDB bill may be used as a vehicle in the closing days of the Legislature to carry additional, unrelated provisions which will cause controversy.

Several other bills are pending in the Legislature which also involve the issuance of industrial development bonds. One pending bill, AB 2324 (Hayes), would establish a California Alternative Energy Source Financing Authority, patterned on the Pollution Control Financing Authority, to issue revenue bonds for capital projects involving alternative energy sources and energy conservation. This bill is tied to a constitutional amendment which will be on the June 3, 1980 ballot (Proposition 8) to specifically authorize the Legislature to provide for the issuance of alternative energy source revenue bonds. This bill is sup-

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

ported by the State Energy Commission. Another approach being used to expand the use of revenue bonds for alternative energy source projects is to bring such projects under the purview of the existing California Pollution Control Financing Authority. One such bill has been introduced, AB 2646 (Bates), to expand the Pollution Control Financing Authority's scope to cover projects which include the use of "renewable energy resource devices or the development of an energy conservation program where such action is designed to reduce the amounts of emissions or pollutants from conventional energy sources." We understand that AB 2646 is being sponsored by a solar energy group. Both AB 2324 and AB 2646 were reported favorably, with amendments, by the Assembly Resources Committee last week. Finally, SB 1330 (Montoya) would authorize Redevelopment Agencies to finance industrial or commercial projects which benefit the redevelopment project and increase employment.

Please feel free to call the undersigned if you have any further questions or wish copies of any of the bills discussed here.

Robert P. Feyer

For

ORRICK, HERRINGTON, ROWLEY & SUTCLIFFE

APPENDIX M

***IDENTIFICATION OF PROJECT RISKS -
CONSULTANT REPORT***

AN ANALYSIS OF RISKS ASSOCIATED WITH
THE IMPLEMENTATION OF A RESOURCE RECOVERY PROJECT
IN THE CITY OF
BERKELEY, CALIFORNIA

Prepared for:

GARRETSON-ELMENDORF-ZINOV-REIBEN

In Association With:

BROWN, VENCE & ASSOCIATES
124 Spear Street
San Francisco, California 94105

Prepared by:

GORDIAN ASSOCIATES INCORPORATED
1919 Pennsylvania Avenue, N.W.
Suite 405
Washington, D.C. 20006
(202) 828-7300

July 18, 1980

Gordian Associates Incorporated

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS.....	i
SUMMARY.....	iii
1. INTRODUCTION.....	1
2. MAJOR RISK AREAS AND GENERAL EXAMPLES.....	2
2.1 Risk Areas Affecting Waste Supply.....	3
2.2 Risk Areas Affecting Markets.....	4
2.3 Risk Areas Affecting Facility Construction.....	6
2.4 Risk Areas Affecting Facility Operation.....	7
2.5 Risk Areas Affecting Disposal.....	9
3. RISKS IDENTIFIED AS POTENTIALLY IMPACTING THE PROPOSED PROJECT IN BERKELEY.....	10
3.1 Waste Supply Risks.....	10
3.1.1 Source Separation Programs.....	12
3.1.2 Competing Local Resource Recovery Projects.	14
3.2 Market Risks.....	19
3.3 Disposal Risks.....	21
3.4 Facility Construction Risks.....	22
3.5 Facility Operation and Management Risks.....	24
3.6 Facility Design Risks.....	27
3.6.1 Trommel.....	28
3.6.2 Incinerator Ash vs. Trommel Residue Disposal	31
3.6.3 Material Recovery System.....	34
3.6.4 Space Consideration for RDF Storage.....	36
3.6.5 Energy Recovery System.....	37
3.6.6 Air Pollution Control.....	40

TABLE OF CONTENTS (continued)

	<u>Page</u>
4. STRATEGIES FOR RISK ALLOCATION AND MANAGEMENT FOR BERKELEY	42
4.1 Alternative Procurement Approaches.....	42
4.2 Implementing Agency's Philosophical Posture.....	48
4.3 Small System Procurement Experience.....	49
4.3.1 North Little Rock.....	49
4.3.2 Pittsfield.....	54
4.3.3 Auburn.....	55
4.4 Specific Levels of Risk.....	57
5. RECOMMENDED STRATEGY.....	62
 REFERENCES.....	65
 APPENDICES.....	67
A. ASTM E702-79 Standard Specification for Municipal Ferrous Scrap.....	A-1
B. Small Resource Recovery Project Gets Disposal Revenue Bond Financing.....	B-1
C. Resource Recovery and Codisposal in Auburn, Maine..	C-1
D. Auburn Steam Contract.....	D-1
 TABLES	
1. Quantities of Major Recyclable Materials Presently Recycled in the City of Berkeley (1980).....	13
2. Major Risk Areas for the Berkeley Project.....	43
3. Modular Combustion Projects.....	50
4. Levels of Risk for Berkeley Project.....	58
 FIGURES	
1. Resource Recovery Procurement Responsibilities Under Three Different Acquisition Strategies.....	45
2. North Little Rock Contracts.....	52
3. Auburn, Maine Contracts.....	56

ACKNOWLEDGEMENTS

We appreciate the contributions to this project made by Mr. Kenneth Woodruff, Resource Recovery Services, Inc., who assisted in analyzing the technical risks and by Mr. Roger Feldman of LeBoeuf, Lamb, Leiby & MacRae who assisted in identifying legal and institutional considerations.

During the course of this effort, study team members called upon different individuals for assistance and information. Cooperation from the following individuals and organizations is acknowledged and appreciated:

City of Berkeley

Mike Baumann
Roy Oakes
Bernton Erickson

Brown, Vence & Associates

Mike Brown
Tom Vence
Tom Reilly

Blyth Eastman Paine Webber Inc.

Rene Rofe
Terrence Comerford

Alameda County

Betty Croley

Orrick, Herrington, Rowley & Sutcliffe

Alan Waltner
Bob Feyer

Pacific Gas and Electric Co.

Joseph Meyer

Teledyne Corporation

Ken Shepherd

Alameda Bureau of Electricity

Jack Shepherd

California Waste Management Board

Armand Polanski

Cooper, Clark & Associates

Larry Burch

Bay Area Air Quality Management District

Dan Goalwin
Herb Johnson
Rober Jung

Cal/Ink

David Pierce

Berkeley Forge

Hank Bruins

California Regional Water Quality Control Board

Harold Singer

Brown & Caldwell

Julie Nilson

Colgate Palmolive

Frank Knafel

Community Conservation Center

Pam Bellchamber

Berkeley Environmental Development Corporation

Yaney McIver

Ecology Center

Kathy Evans

Berkeley Youth Recycling

Marco Gonzalez

U.S. EPA

Davis Bernstein
Chris Knoblock

SUMMARY

An analysis of risks associated with resource recovery for the City of Berkeley has been undertaken. Generally, risks associated with the development of a resource recovery project occur during two distinct phases: (1) risks impacting the project during the facility construction phase, and (2) risks involved in the operational phase. The level of risk resulting during these phases depends greatly upon the manner in which issues related to waste supply, markets, facility design, construction and operation are addressed in the implementation and procurement planning phases of the project.

This analysis addresses these different risks generally and as they apply specifically to the project being planned by the City of Berkeley. Alternative risk management strategies are presented along with a recommended strategy.

Waste supply is one of the more significant risks identified in the Berkeley project. Currently, the city collects only residential waste, or controls approximately 63 percent of the waste stream targeted for the proposed facility. The remaining refuse proposed for processing is to be from neighboring communities and private haulers collecting waste in Berkeley that is not collected by the city. Although Berkeley has to provide for solid waste disposal either for its own collections or by private carters, it cannot be predicted what amounts of refuse will find their way to a future resource recovery facility. For private carters in particular, the tipping fees to be charged will be a main determinant to their tipping at Berkeley or in another disposal facility. Alternatively, if the city decides to participate in a project as a main sponsor it must be in a position to predict the amounts of refuse or must be willing to enter into a waste supply contract that will establish either a minimum tonnage or minimum budgetary support of the operations. Tonnages can be potentially diverted by aggressive source separation activities locally or by competing projects that are being planned by the City of Alameda, West Contra Costa, and Oakland Scavenger Co. at Davis Street. Concerns due to source separation should be minimal. However, other competing projects

provide both concern over diverting other Berkeley waste from a city resource recovery project and an opportunity for the city to participate in someone else's project as a waste supplier. This latter question should come down to a matter of economics and conditions of eventual participation.

At this stage in the project's development, the energy markets have been identified. The site for the project is predetermined and may provide for less than optimal location vis á vis energy markets. However, having a site at this point is an important asset. The arrangements with the steam market, Cal Ink, and the electricity purchaser, Pacific Gas & Electric, need to be further developed. As a result of their statewide efforts in purchasing electricity from small producers of electricity and industrial cogeneration systems, PG&E should be in a position to move readily to purchase arrangements. The financial stability of these markets is important to the future viability of the project.

The risk associated with the disposal of ash residue as a hazardous waste has been taken into account in the economic projections. However, as outlets for disposing the ash residues will be provided through private sources, the long term residue disposal cost cannot be projected with a high degree of certainty. Additionally, the location of future process and ash residue sites may become further removed and thus increase disposal costs.

Risks associated with the actual facility are in the areas of design, construction, and operation. The proposed design prepares the refuse for selective processing. Basic areas in the design involve risk. These are the design and effectiveness of the trommel in achieving the desired separation, the generation of incinerator ash vs. trommel residue for disposal, the design of the materials recovery system to assure that marketable products are produced, the design of the refuse derived fuel storage area to provide for sufficient storage to facilitate the 5 day/7 day operational schedule specified, and the efficiency and performance of the energy recovery system. It is Gordian's judgement that these risks have been adequately taken into account to the extent that can be expected at this point in time and given their design experience at other similar operations related to

the processing and storage aspects of the design. The energy recovery aspects of the design are unique to the proposed technology only to the extent that a turbine set will be included as part of the energy generation module. There does exist substantial operating experience with similar steam inlet conditions to turbines for electricity production. It should be recognized nonetheless that the design parameters in this project will produce electricity relatively inefficiently as compared to larger, more efficient systems using fossil fuels. Overall, however, there is a net energy gain in the system.

Risks associated with facility's construction have a great deal to do with the procurement method selected. Cost overruns, increases during construction caused by poor design data, mismanagement inflations, the acceptance of a construction cost escalation formula that outstrips inflation and is higher than contractor costs, or even a force majeure situation, are always risks; however, they can be reduced, or managed to a large extent, through sound contracts, performance bonds and other controls. Changes in laws and regulations relating to construction specifications may also occur, which could increase cost and delay the project. Once the facility is fully constructed, it may be unable to meet acceptance tests, such as failure to produce minimum energy outputs or failure to demonstrate consistent performance at design throughput over a set time period. It should also be noted that the proposed project entails a risk of permit delay for the facility. There are a myriad of permits which will need to be acquired; perhaps foremost among them is the permit for emissions.

Once the project is on-line there are many areas where the risk of cost increases can occur: O&M costs higher than projected; unscheduled outages or excessive downtime; inflation; force majeure situations; regulator changes; etc. If the facility is owned or operated by a private party, there is the risk that an operator may turn away certain waste streams or fail to accept the waste as planned. Perhaps one of the greatest risks once the system is accepted and in operation concerns the system's reliability and performance. In the system design envisioned for the Berkeley project, it will be important to ensure that such key equipment risks as superheater tube life, turbine downtime, boiler efficiencies, trommel operation, ash quality, and air

pollution control equipment are minimized through proper warranties, performance guarantees, or other safeguards. It is important to point out that some vendors will not provide certain guarantees unless they actually operate the system or install specific components. Plant operating and supervisory personnel represent potential risk areas if not qualified for their positions. The risks posed by lack of trained and dedicated plant personnel cannot be overemphasized. Cost escalation due to inflations is always a risk. In many projects, certain cost increases are tied to standard indices. There is always a risk of inflation lagging or leading any chosen index. Historical data and current trends should be examined when negotiating any contracts involving indices.

There are a wide range of strategies that can be undertaken to mitigate the above-mentioned risks. In large part, the strategy's direction depends upon the procurement approach that will be followed. Several methods for procuring and operating resource recovery facilities exist. During the selection phase of procurement, the decisions made regarding system type will be systematically translated into the operational facility design. This process involves contractor selection, contract negotiation, facility construction, operational testing and acceptance, and operations. There are three basic procurement options. The first is the traditional architect-engineer approach (A&E); the second is the turnkey approach and the third is a full service approach. There are, however, potential modifications to each. The choice of one strategy over the other depends largely upon the issues of ultimate facility ownership, allocation of risks between the city and private contractors, legal restrictions, and availability of financing. The difference between these approaches is the number of parties the sponsor of the project deals with contractually over the course of the facility's design, construction, start-up and operation. In an A&E approach, the sponsor would deal with many, in the turn-key fewer, and with the full service approach conceivably one. The fewer parties involved, the more the responsibility for performance can be directed.

The implementing agency's philosophical posture is very important to consider in determining which procurement approach will be undertaken. Remembering that the primary purpose in undertaking a resource recovery project is to provide for the sound disposal of solid waste without creating a public health hazard or an environmental pollution problem, municipal officials are faced with deciding between traditional and nontraditional approaches. Resource recovery companies exist which are willing to provide equipment and/or services to address municipal needs under any conceivable project structure. City officials will need to decide what degree of control they wish to have in maintaining the public health aspects of solid waste disposal, either directly or through contracts for service. Similar decisions will need to be made regarding which capital financing vehicle the city can go through.

A growing number of small resource recovery systems are being planned and implemented. The experience of projects which have moved forward into construction and operation phases provide an interesting perspective. The A&E approach has been the most common in the twelve localities that are either operating or constructing small modular units. However, two recent procurements - Auburn, Maine and Pittsfield, Massachusetts - and North Little Rock's recent award of the operating contract to Consumat Systems Inc. indicate a new trend in municipal procurement of small systems as well.*

A characterization of high, medium, and low levels of risk posture the City of Berkeley could take in dealing with the six major areas of specific risks to its project has been prepared. (See Table 4, page 58). These areas addressed are:

- Waste Supply - assuring quantity and quality of input for the project;
- Market - assuring the use of products and the expected levels of revenues;
- Facility Construction - assuring the facility is completed per the design, within time and budget;

* Section 4.3 of the report provides a review of the decision making process in these locations mentioned.

- Facility Operation and Management - assuring that the facility is operated, maintained, and managed in a manner which provides for the performance requirements which underlie both the solid waste disposal and economic objectives of the project.

The High risk strategy for each of the above-listed areas represents an implementation approach which would provide the greatest opportunity for city exposure in the project. Under the Medium risk posture characterization, a somewhat less exposed position is represented, while in the Low risk characterization, conservative posture is characterized. If lower risk approaches were followed the city would be led toward a project which had greater opportunity for meeting economic targets, performance expectations, and disposal objectives. If high risk strategies are followed, then there is a greater possibility that these same objectives will not be met.

The relative importance of the risks is qualitatively judged as follows:

<u>Importance</u>	<u>Risk Area</u>
• High	Competing Projects Markets Facility Design Facility Construction Facility Operation
• Medium	County Approval Disposal
• Low	Source Separation

Berkeley should take into account these levels of importance when deciding upon the risk strategy to take for any specific risk area. The above also serve to indicate a prioritization of attention and activity toward resolve by Berkeley staff and its consultants.

Specifically, it is recommended that the City of Berkeley:

- Obtain a steam sales agreement with Cal. Ink so that expected revenues and performance requirements are more certain;

- Obtain an electricity sales agreement with Pacific Gas & Electric so that expected revenues, performance requirements and penalties for non-performance are clear;
- Proceed with the transfer station portion of the project given other sites and/or energy markets will not be considered;
- Obtain extension of landfill permit at current site to provide for interim disposal over next 3-4 years, i.e. a period over which Berkeley can move into alternative recovery disposal systems;
- Negotiate with competing projects to determine the costs, arrangements, and timing for either Berkeley supply or receipt of solid waste over a long period of time--especially with the County of Alameda;
- Prepare a Request for Proposal for Full Service Resource Recovery Services to be positioned to solicit contractors and determine the real bid cost for the proposed project;
- Prepare a Request for Disposal Services for release simultaneously with the resource recovery procurement in efforts to evaluate alternative disposal options available in the future;
- Implement a waste control strategy such that predictable quantities of refuse will be available for the project or for transfer either to a disposal facility or to another resource recovery project;
- Select a financing method and put in place a structure to undertake financing via the method selected;
- Issue RFPs for a full service contractor and disposal services, evaluate proposals, and be positioned to negotiate/sign contract(s);
- Update project economics as part of a proposal evaluation procedure and compare to alternative disposal proposals; and
- Do not proceed with the transfer station part of the project until at least energy markets are confirmed for the current site.

It is recommended that if the city does proceed with resource recovery facility procurement the city proceed to undertake the project through a full service procurement, whereby a private vendor would be sought to design, construct and operate the system according to certain

performance guarantees established by the city in its Request for Proposals. The city, in turn, could make at least initial arrangements with the energy user and provide minimum amounts of solid waste for processing and guarantee the operator minimum revenues for having processing capacity available. The city could also seek to provide additional supplies--either through waste control measures or through supply agreements with neighboring municipal governments, including the county. The city would bear the risk of assuring available landfill for emergency requirements, and passing through excess costs to the operator if covered in the performance requirements agreement with the operator. In the same manner, the city would make necessary arrangements for ash disposal and pay for its disposal directly, thereby not affecting the economics of the resource recovery operation.

If competing resource recovery projects or transfer and landfill proposals look more favorable economically and can in fact guarantee an outlet of disposal over a long period of time, the city may elect to enter into a contract with another project.

In the mean time, the city can proceed with the construction of the transfer station at the currently selected site so that it has the flexibility to either tranfer its waste to another project/landfill or provide for emergency haul out if the site does include resource recovery in the future.

The timeframe in which the above implementation strategy takes place depends greatly on the degree of urgency the City of Berkeley places on developing alternative outlets for solid waste disposal. The main determinant will be the amount of time that the current landfill will be allowed to operate as a result of the future permit extension application from the U.S. Army Corps of Engineers. It is expected that 3 to 4 years additional operating time will result. If longer, there will be less pressure on the city to proceed, and if shorter, a crisis situation may set in. The timetable for implementing altenative solid waste disposal should be established as a result of this timeframe and given the economics of the different options.

It will be important to develop the risk and implementation plan with input from decision makers in the City of Berkeley. Through give-and-take exchanges on the issues analyzed and the recommendations made in this report, municipal officials can develop both an understanding of the venture they are considering and the most appropriate posture to take in developing an alternative long-term solid waste disposal solution through resource recovery.

1. INTRODUCTION

Generally, risks associated with the development of a resource recovery project occur during two distinct phases: (1) risks impacting the project during the facility construction phase, and (2) risks involved in the operational phase. There are several risk areas that need to be addressed in the planning and procurement of a project; those risk areas generally include waste supply to the project, markets for recovered products, facility construction, facility management and operation, and waste disposal.

This analysis is presented in a framework that addresses those major areas of risk and focuses on risks perceived by the consultant as potentially impacting the proposed Berkeley Project. The more significant risks are discussed in greater detail and a special section on technical/design risks is included for consideration by the project engineer.

Finally, alternative strategies for managing risks and a recommended program for risk management are developed and presented for consideration by the City of Berkeley.

2. MAJOR RISK AREAS AND GENERAL EXAMPLES

The following section has been excerpted from the publication, Resource Recovery Plant Implementation Guides for Municipal Officials Risks and Contracts, compiled for the U.S. Environmental Protection Agency, Office of Solid Waste, by Robert E. Randol in 1976. It has been modified by Gordian to further clarify examples of risks. It serves as a useful guide in understanding the relevant areas of risk in resource recovery project implementation.

2.1 Risk Areas Affecting Waste Supply

<u>Risk Area</u>	<u>Examples</u>
Waste Composition	New laws or consumer behavior can alter the composition of the waste. Changes in the composition of the waste stream, in turn, can: (1) lower the fraction or quality of combustibles or recoverable materials and thereby reduce the revenue potential per ton of input; or (2) increase the unprocessable wastes to be landfilled and, thus, increase the net cost of operations.
Waste Quantity	New laws affecting consumer behavior can cause seasonal or permanent reductions in the quantity, which, in turn, will result in: (1) increased costs to process each ton of waste (because of fixed cost associated with facilities and equipment); and (2) decreased total annual revenues and, therefore, return on fixed investment.
Jurisdiction Withdrawal	If a jurisdiction decides to discontinue delivery of waste to a recovery facility, all the consequences of a waste quantity change, plus the possibility of discontinuing recovery operations, are felt by other participants in recovery operations. Generally, no public legislative body may bind future legislative bodies to continue to participate in a project (i.e., regional system).
Competition from Processing Alternative	Resource recovery is undergoing significant technological change. If a new competing processing alternative is implemented and attracts some of the waste that could have been processed by the recovery facility, then the consequences are the same as those for a waste quantity change.

2.2 Risk Areas Affecting Markets

<u>Risk Area</u>	<u>Examples</u>
Competing Materials Prices	Reductions in the price of primary fuels and/or secondary materials may drive down the prices for the recovered fuels and materials, thus, reducing project revenues. If these reductions force the project into a period of economic frustration, operations may have to be discontinued.
Substitutability of Recovered Product	Due to changes in production processes, recovered fuels and/or materials may in the future be less substitutable for primary fuels and materials. Although most trends are <u>toward</u> recovered materials, some are not (notably power generation where the overall trend is toward nuclear plants). The more likely event is that the specifications required of recovered fuels and materials by buyers could exceed a recovery facility's ability to produce. In either event, the revenues of the recovery project could be reduced and some of the output may have to be landfilled.
User Incremental Costs	Buyers of recovered materials or fuels may have to make unanticipated investments in order to use them, or their operating costs may increase as a result of their use. These cost impacts may be reflected in the price that the user is willing to pay for the products - or in demands on the recovery project for user-based investment - thus affecting the recovery project's cost and/or revenues.
Shipment Size and Frequency Requirements	Most producers require that raw material shipments be scheduled over regular intervals and sized according to their production schedules. Deviations from these requirements by suppliers can cause production problems. If a recovery project cannot consistently meet the delivery requirements of its buyers, then its marketing contracts may be cancelled. This would affect project revenues and could put the project in jeopardy.
User Specifications	Requirements by users of recovered fuels or materials for consistent quality could affect: (1) the operating cost of the recovery project; (2) the price paid by buyers per unit of output; or (3) the duration of the contract between the project and the buyer. In the extreme case of inability to meet specifications, the project may find its marketing contracts cancelled.

<u>Risk Area</u>	<u>Examples</u>
User Location	A change in the locations of one or more buyers of recovered materials or fuel could affect the net price (net of transportation costs) per unit of output and, in the extreme case, the ability of the recovery project to service the buyer. In either event, the revenues of the project would be affected.
User's Financial Condition	If the buyer of recovered fuel or materials goes out of business or is unable to pay for deliveries, the project's revenues will be correspondingly diminished.
Legislation and Regulations	Changes in freight rates and rate structures could result in higher transportation costs (and, possibly, lower net revenues) or in cost discrimination against a recovered fuel or material. Either event could affect both the demand for and the price of recovered materials and fuel.
Contract Duration	Marketing contracts may elapse before the investment in the recovery facilities is recovered. This could place the project in a precarious position should the operator be unable to renew the contract or find new buyers.

2.3 Risk Areas Affecting Facility Construction

<u>Risk Area</u>	<u>Examples</u>
Delays	Delays in the completion of construction and in the start-up date can cause cost overruns in the project and necessitate the continued use of obsolete or undesirable disposal methods. Delays also result in an inability to deliver the anticipated output of the recovery plant to customers.
Contract Suspension	Suspension of a construction contract has the same consequences as construction delays.
Increased Capital Costs	Increases in the cost of equipment or materials during the facility construction phase can cause the cost to process each ton of waste to increase as a result of the increased fixed cost. If these increases are large enough, the entire project may be jeopardized if additional financing cannot be secured.
Site Availability	If it proves difficult to find and acquire a facility site that is environmentally suited to recovery operations: (1) the project may be delayed; (2) the cost of operating may be increased, especially if the site is distant from the source of waste and/or the buyers of output; or (3) the project may be jeopardized.

2.4 Risk Areas Affecting Facility Operation

<u>Risk Area</u>	<u>Examples</u>
System Reliability	Since solid waste cannot be stored for more than a short period, excessive downtime for the recovery system may result in foregone revenues from material or fuels that otherwise would have been recovered and sold. Likewise, inferior quality of recovered materials could result in lower prices per unit and, therefore, reduce revenues. Either event could lead to cancellation of contracts for purchase of outputs. Either event also could require temporary use of a less desirable means of waste disposal which would add to the total system cost. (NOTE: The solid waste must be disposed whether the system is operational or not.)
Economic Frustrations	Should the participants in the resource recovery project find it impossible to operate at a reasonable cost, the project may be jeopardized with the consequences of: (1) having to find alternative means for disposing of the waste; (2) discontinuing or revising whatever services relied upon the output of the recovery facility; and (3) satisfying debts to project financers.
Inflation	Inflationary forces may increase operating costs faster than revenues are increasing, thus causing the project's net cost to increase. In addition, if <u>allowable</u> cost increases are tied to a national or state cost index and the index changes faster or slower than the actual costs, then one or more participants in the project may suffer economically.
Labor Productivity	Reductions in the productivity of labor may cause the operating cost of the project to increase or could result in an inability to process the targeted tonnage per day. The latter consequence would result in lower output of materials and reduced revenues.
Hazardous Wastes	Should explosive, radioactive, or chemically dangerous wastes find their way to the recovery facility, the health and safety of the project's labor force and the safety of the facility itself may be jeopardized. This could result in unscheduled downtime or even cancellation of operations. The consequences could include lost revenues, increased costs, interrupted production, and temporary use of alternative disposal methods.

<u>Risk Area</u>	<u>Examples</u>
Legislation and Regulations	Certain legislation, especially that which could affect waste quality (e.g., mandatory source separation), or facility design (e.g., pollution control standards), could result in decreased revenues or increased costs per ton of waste processed. In the extreme case of removing a large portion of the input to an individual subsystem of a resource recovery plant (such as the possible effect of beverage container deposit legislation on an aluminum recovery subsystem), the economic viability of that subsystem may be jeopardized.
Waste Stream Quantity and Composition	Discussed under "Waste Supply" risks.
Storage Capacity	If the storage capacity for incoming waste or outgoing materials is not sufficient to handle emergencies (such as shut-downs, storms, etc.), then waste may have to be diverted to alternative disposal. This could affect project costs and revenues.

2.5 Risk Areas Affecting Disposal

<u>Risk Area</u>	<u>Examples</u>
Site Capacity	The capacity of the disposal site for residuals from the recovery operation, and for unprocessable wastes, may run out before the end of facility operations, thus causing a need to find an emergency disposal site (probably at extra cost).
Legislation and Regulations	Regulations may be implemented which require design changes for landfills (e.g., liners to prevent ground water pollution). This would increase the cost of recovery system operations.
Site Location	A change in the location of the site for landfilling residuals could increase operating costs by requiring a longer haul from the recovery facility to the landfill.

3. RISKS IDENTIFIED AS POTENTIALLY IMPACTING THE PROPOSED PROJECT IN BERKELEY

In our efforts to identify risks that should be of specific concern to the Berkeley project, Gordian undertook the following steps:

- Performed a thorough review of the project's documentation;
- Conducted a field trip to the Berkeley area and interviewed key staff, participants and consultants involved in the project;
- Participated in a workshop with City staff and consultants to both review status of developing work efforts and to identify risk areas;
- Conducted telephone interviews with representatives of competing projects, equipment vendors, operating resource recovery plants, energy users, etc.; and
- Reviewed recent consultant reports concerning financing and legal issues.

The discussion which follows identifies major risk areas which Gordian believes should be addressed in Berkeley as this project moves toward procurement consideration.

3.1 Waste Supply Risks

Waste supply is one of the more significant risks identified in the Berkeley Project. Currently the City only collects residential waste and/or controls approximately 63 percent of the waste stream targeted for the proposed facility. This amounts to an estimated 38,000 tons per year (although a recent weighing program indicates this tonnage might be low and a figure closer to 44,000 tons per year might be collected and controlled by the City, however, although weigh data is limited at this time). The remaining refuse proposed for processing in the project is from neighboring communities and private haulers collecting waste in Berkeley that is not collected by the City. Addition-

ally, it is speculated that several local industries as well as some Berkeley citizens would self-haul combustible waste to the facility.

One of the key factors in the viability of this project will be the amount of waste that can actually be committed to it. There is some indication also that the City would be unwilling to commit to a guaranteed minimum quantity delivery or sign a "put or pay" type agreement for waste delivery if a full-service or modified full-service or modified turn-key procurement approach is pursued. Such an agreement has historically been the cornerstone of those types of procurement, and it is doubtful that a private operator would assume the risk of marked waste shortfall.

Berkeley's ability to control waste flow through legislation is uncertain as is the City's desire to effect such waste flow control.* The risk of a hazardous waste, such as an explosive or dangerous chemical, entering the facility is always present. Many resource recovery projects have experienced fires or explosions due to such problems.

The composition of the waste stream available to the City may change as current source separation recycling activities increase, as new laws are enacted, or as consumer preferences create trends such as the use of retortable plastic-film aluminum foil laminate pouches in place of steel cans for the room temperature storage of food. On a statewide basis, mandatory deposit legislation has been proposed every year but has been defeated. There is considerable support for such legislation in some quarters and it could be passed in the future. In a more direct application, the City of Berkeley has enacted a mandatory deposit statute which is now being contested in court. If this law is upheld, it would have a significant impact on the metals and glass fractions in the refuse stream to the facility.

A waste composition study has been initiated in the City to better assess the waste contents and provide data for further facility design and cost estimating. While the ongoing recycling efforts in the City would appear to have a negligible effect on the project and may benefit the project by removing many of the materials that become ash or trom-

* During the course of this effort, legal counsel to this project has undertaken analysis of this issue as background to an eventual strategy.

mel residue for disposal, they have to be anticipated as their expansion in paper recovery, aluminum recovery, and perhaps ferrous metals recovery will marginally impact the revenues projected for the project.

The following brief discussion addresses the current status of source separation efforts in the Berkeley area with emphasis on the potential risks they might present to a resource recovery facility.

3.1.1 Source Separation Programs

Source separation programs have proven very successful in recovery and returning valuable materials to the manufacturing process and in reducing landfill disposal quantities and costs. In addition, these recycling programs can aid in reducing significant quantities of non-combustible materials (e.g., glass, aluminum), which are undesirable in an energy recovery system. In the case of the Berkeley Project, source separation may prove beneficial in lowering the ash content of the processed waste which may have to be landfilled as a hazardous waste or otherwise not recovered for sale. However, source separation programs may also pose a potential risk to a resource recovery facility by removing significant quantities of materials that may otherwise be estimated to be recovered as salable products and factored into the project economics. Therefore, the feasibility of any resource recovery system must evaluate the compatibility of the proposed system with local source separation programs.

At the present time, there are five major recycling groups conducting a variety of source separation programs in the City of Berkeley, in addition to commercial and industrial recycling efforts. In 1980, these groups will recover approximately 6600 tons of secondary materials or about 30 percent of the 22,100 tons of recyclable waste estimated to be initially available to a potential resource recovery facility (Table 1).* Although it is difficult to determine the recovery

* Based on data derived by Terry D. Harrison, Quantities of Major Recyclable Materials in the Waste Stream Following Curbside Collection and Other Recycling Programs (Draft), April 1980.

TABLE I
QUANTITIES OF MAJOR RECYCLABLE
MATERIALS PRESENTLY RECYCLED
IN THE CITY OF BERKELEY (1980)*

TONS PER YEAR

RECYCLING ACTIVITY	FERRUS METALS	ALUMINUM	GLASS	NEWSPAPERS	CORRUGATED BOXES
<u>SEPARATE PICK UP PROGRAMS</u>					
(1) Ecology Center	-	-	-	960	-
(2) Recovery Recycling	4	1	16	2	4
(3) Berkeley Youth Alternative	5	3	73	4	68
<u>RECYCLING CENTER</u>					
(4) Community Conservation Center	90	18	1,020	600	72
(5) Bay City Resource Recovery	1,100	60	-	-	-
<u>INDUSTRIAL AND COMMERCIAL RECYCLING</u>					
(6) Industrial Recycling	550	5	-	-	140
(7) Commercial Recycling	-	-	110	-	1,700
TOTAL	1,749	87	1,219	1,566	1,984

* Terry D. Harrison, Quantities of Major Recyclable Materials in the Waste Stream Following Curbside Collection and Other Recycling Programs (Draft), April 1980.

potential for source separation programs in the future, one local recycling administrator estimated that a city-wide recycling center located at the proposed resource/energy recovery site, along with other local recycling programs, could divert as much as 1,200 tons of recyclable materials per month or 14,400 tons per year.*

A recently completed study concurred with those estimates that projected increased recycling activity in the future. Due to an upgrading and expansion of present recycling activities in the City and also in areas just outside the city, the study estimated that the quantity of materials recycled in the future could increase from the present 6,600 tons per year to 8600-14,000 tons per year in the future.** In addition to potentially reducing the Btu content of the waste mix, removing a large quantity of materials from the waste stream (particularly in waste generated outside the city and dumped at the facility) could negatively impact the amount of revenue derived from the facility's tipping fee.

The next section addresses the risks related to the presence of several alternative resource recovery projects in the Berkeley area.

3.1.2 Competing Local Resource Recovery Projects

Although the Berkeley Resource Recovery Project is proposed primarily to serve the City of Berkeley, approximately 10,000 tons per year are anticipated from surrounding communities. In view of several other proposed projects in the area, there is no assurance this waste would enter the project once constructed or continue over its life unless reasonably long-term contracts were executed with those communities and/or their haulers. Additionally, waste flow control ordinances or hauler licensing which requires disposal at the Berkeley facility

* Telephone interview with Pam Bellchamber, Administrator, Community Conservation Center, Berkeley, California March 18, 1980.

** Based on data derived by Terry D. Harrison, Quantities of Major Recyclable Materials in the Waste Stream Following Curbside Collection and Other Recycling Programs (Draft), April 1980.

may be necessary in each community. In the wake of Proposition 13, the least cost alternative would be of prime importance to those communities and they may be unwilling to commit to any contract if they envision some lower cost option "just a few years away."

Taking this discussion further, perhaps the greatest risks to the project are the several competing alternative systems being proposed in the Berkeley/Alameda County area. The viability of these proposed projects is uncertain but most of them would be competing for Berkeley's waste stream, and Berkeley officials may be inclined to favor one of these alternatives or take a "wait and see" posture that would effectively abrogate this project. Any of the alternative systems, once implemented, could also attract waste brought to the Berkeley Project by private haulers, industries, or others not willing to commit to long-term agreements or otherwise committed by waste flow control laws. It is important to note that a delay in deciding to implement this project, at least the development of the transfer station in Berkeley, poses the risk of much higher costs to develop facilities once a go ahead decision is made and a risk that none of the projects Berkeley officials are waiting to see develop actually would be effectuated.

The following discussion focuses on the potential risks to Berkeley's project that derive from the presence of these several proposed alternative resource recovery projects in the immediate area. In general these risks fall into two interrelated categories.

The first category relates to Berkeley's ability to secure an adequate supply of waste for its project in the face of the several nearby projects which may also be competing for adequate waste supplies. However, it should be recognized that Berkeley has the responsibility to provide for waste disposal.

A second related risk area stems from the basic issue of whether these competing projects have received sufficient evaluation to definitively determine if they offer more cost-effective solid waste disposal solutions for Berkeley than implementing plans for its own facility.

Before discussing these risk issues further, it is appropriate to take a closer look at the competing projects. There are three* proposed systems within fifteen miles of Berkeley (using the proposed solid waste management center as a central point). The three projects, which are discussed briefly below, are: the City of Alameda Resource Recovery Facility; the West Contra Costa Resource Recovery Facility; and the Davis Street Transfer Station/Resource Recovery Facility.

City of Alameda Resource Recovery Facility

The Alameda Bureau of Electricity, a city owned electric utility, has been planning for a 1,500 TPD (1,100 TPD of RDF) resource recovery project since 1975. The facility would process refuse into RDF, burn it to produce steam, then use the steam to turn turbines to generate electricity. This project is currently in the process of securing required permits and performing an Environmental Impact Report (EIR) on the selected site. The system concept has been determined and they are preparing to enter final design. Further credibility is given this project by the extensive favorable financial analysis that has been performed by Blyth Eastman Paine Webber Inc. and Price-Waterhouse.

Although this facility will be sited within fifteen miles of Berkeley, it does not currently plan to include Berkeley's waste. However, since the system, as planned, calls for 1,500 TPD and the Bureau has only secured some 400 TPD at present, they have expressed a willingness to accept Berkeley's refuse if available. Because of traffic congestion, the Bureau's proposed facility will accept only longhaul vehicles which means that Berkeley would have to implement a transfer station.

According to representatives of the Bureau of Electricity, the project is moving ahead and is scheduled to have the site finalized

* There are other waste disposal facilities in the surrounding area (specifically the Acme, Vasco Road, and Altamont sites) but they are not considered here because of their distance from Berkeley. Alameda County was originally considering a transfer station in the City of Berkeley but those plans have been revised in view of the surfeit of proposed resource recovery facilities.

this spring, an EIR completed in the fall, and to be on-line by 1984. At this point, the estimated range for the tipping fee is from \$7 to \$10.

In summary, it appears that this project is moving toward implementation and that it could provide a processing alternative for Berkeley. The cost-effectiveness of this option is uncertain due to the preliminary nature of the economic estimates but the proposed \$7-\$10 tipping fee may not necessarily eliminate it from further evaluation. The system apparently will not actively solicit Berkeley's wastes but in view of the large quantity of refuse it requires, any wastes that are not positively secured by Berkeley would be considered as potential input to this system.

West Contra Costa Resource Recovery Facility

The West County Agency of Central Contra Costa County is sponsoring a resource recovery project that proposes to codispose of 400 to 600 TPD of solid waste along with varying quantities of sewage sludge. This facility would be located either at the West Contra Costa Sanitary District's wastewater treatment plant or further south at Hensley and Castro Streets in the City of Richmond. These sites are approximately twelve and nine miles, respectively, from the SWMC site in Berkeley.

The WCC system currently plans to employ an O'Connor rotary combustor to incinerate the refuse and produce steam which will be marketed to one or more nearby industrial markets. It is also possible that the system will use the steam to generate electricity for use in the adjacent wastewater treatment facilities,

This project has currently secured around 400 TPD of refuse from the City of Richmond and the WCC Sanitary District. They are very interested in additional waste supply and feel that Berkeley's wastes would be the logical source because of the relatively short-haul distances involved and because the Richmond landfill is already receiving some 30-60 TPD from private haulers serving Berkeley. According to a representative of Cooper-Clark, the consulting engineer working on the

project, current estimates for tipping fees range from \$2 to \$5 depending upon whether steam or electricity is the final product.

The project is scheduled for preliminary design this spring with final design in the fall and initial operation by mid 1984.

The risks which this project present to Berkeley's Project are similar to those raised by the Alameda City Project. Specifically, any wastes that are not firmly committed to Berkeley will be potential input to the WCC Project, especially in view of the short-haul distance and low proposed tipping fees. Furthermore, if this project continues towards implementation, it may provide a significant risk to implementing a facility in Berkeley because of the potentially more cost-effective waste disposal option it offers.

The Davis Street Transfer Station/Resource Recovery Facility

The Oakland Scavenger Company is currently constructing a transfer station at the site of the Davis Street Landfill in San Leandro off Highway 17. In conjunction with the transfer station, an RDF processing facility designed by Teledyne is also being considered for the Davis Street site. Originally, the RDF was to be hauled to Crockett for combustion at the C & H Sugar Plant. However, representatives from Teledyne recently expressed interest in constructing boilers and steam powered turbines at Davis Street to enable the generation of electricity for sale to either PG & E or the Alameda Bureau of Electricity. Another option is for the Alameda Bureau of Electricity to purchase RDF from the Davis Street facility for combustion in their own dedicated boiler system. According to Teledyne, the preferred option will be determined by the market that offers the highest price. Conceivably C & H could still be the market, although Alameda has first right of refusal on any recovered energy products because of the County's Solid Waste Management Plan.

The Davis Street facility is approximately fifteen miles from the proposed SWMC in Berkeley. Teledyne currently estimates that the per ton tipping fee at the Davis transfer station will be in the \$8 to \$9

range with an additional \$1 to \$2 fee levied as the incremental cost of a resource recovery facility (electricity generating). If Berkeley were to direct-haul to the Davis Street facility, they may have to pay the full price (plus their own haul costs). Alternatively, if Berkeley implements its own transfer station, they would be charged only the incremental resource recovery fee.

The Davis Street Project currently has access to all of the waste collected in the surrounding area by Oakland Scavengers. The project is interested in additional waste because increased throughput would reduce per ton costs. They will proceed without Berkeley's refuse but would prefer to include it.

The project is on a slightly faster implementation schedule than the two systems just discussed. Teledyne is hopeful that the markets question will be resolved by this summer and that final design would then commence immediately with start-up slated for late '83-early '84.

The risks presented by the Davis Street Project are virtually identical to those connected with the two competing projects. The risks from all three projects are summarized below:

- Any one, or a combination, of these projects could siphon off any of Berkeley's potential waste supply that is not absolutely committed. The resulting decrease in the system's capacity would have potentially detrimental effects upon the project's reliability, marketability and overall economics as pointed out in earlier sections.
- Each of these projects is operating under roughly the same time table for implementation as Berkeley's project. However, if one or more of these systems could demonstrate that it offered Berkeley a less costly solid waste management option, then the chance of implementing an independent system in Berkeley would be considerably less.

3.2 Market Risks

Normally, resource recovery projects are approached on the basis that "markets drive the technology to be employed." Moreover, other market considerations, such as facility siting in proximity to markets,

are usually sought. In the case of the proposed project, there are currently no contracts for sale of products, or letters of intent to purchase or bid for purchase of recovered products (which may be required by local procurement statutes). However, recent meetings with proposed markets Pacific Gas and Electric Co. and Cal. Ink have been encouraging. PG&E has agreed to submit a letter of interest and the project consultant, GEZR/Brown, Vence & Associates has requested a letter of "intent to enter negotiations for steam purchase" from Cal. Ink. Furthermore, a site has been acquired by the City for the project; however, the site is not adjacent to a customer which could accept the full estimated steam output of the project. While the project can probably provide electricity under a long-term contract to the local utility (although the point of connection to the power system and associated costs have not been determined), it may have foregone higher revenue by virtue of its location. Further, there is the risk that long-term "take or pay" contracts for steam would not be acceptable to the proposed steam market. California Ink, and its parent firm, Flint Ink, will most likely have to agree to any contract proposed for long-term steam sales. (In the case of the Auburn, Maine project, the steam market's parent company held up the steam sales agreement several months until it was satisfied with the terms of the contract.)

There is an indication that ferrous metals from the project might be marketed to local scrap dealers in view of current, higher prevailing prices. Most scrap dealers are not accustomed to signing long-term agreements and thus, if this outlet is selected and a long-term contract with a guaranteed floor price is not secured, there is the risk of losing that market at some point in the future. The result will be the loss of revenues and the increased cost of disposal unless a substitute market is found. While ferrous revenues on an input ton to the system basis are minimal, disposal impacts could be more significant. Further, the ferrous metal market is quite cyclical and is normally not assured far into the future. All secondary materials markets are affected to some extent by worldwide prices and demand.

There is always the risk of a system not being able to produce products which meet specifications or the operator being unable to meet delivery requirements established in any market contracts. Standard specifications for recovered products are just starting to appear. All products from the proposed project, even steam and electricity, would have to meet some specifications. Failure to meet them could result in rejection of the product or termination of the contract for sale if there is a persistent problem.

The financial stability and future plans of markets represent another risk. In the case of the proposed electricity sale to PG & E the risk is minimal; however, for companies like California Ink (Flint Ink) that might purchase steam or certain materials markets, this risk is somewhat greater and should be carefully weighed in structuring any contracts for product sale.

3.3 Disposal Risks

Of the risks that will impact the costs of the proposed project, one of the greatest is associated with the disposal of residue. In view of incinerator residue being classified as a hazardous waste in California, the limitations on where it can be disposed of are significant. The project economics do include this in the analysis. If ash residue were deemed non-hazardous in the future, the project's economics would benefit.

The City or its contracted operator or other owner will need to secure long-term assurance of suitable residue disposal facilities. As landfills which can accept incinerator ash reach capacity, the distance to new sites may increase significantly as may the attendant haul costs and tipping fees. Too, there is a need to have a contracted back-up or emergency landfill during periods of plant downtime or other periods when the recovery plant may be forced to close. Other nearby communities may be competing for limited landfill capacity in the future as well, and what may look like a sufficient fall-back in the short term may become a limited and expensive alternative in the future.

There is always the risk of regulations regarding land disposal sites becoming more stringent or requiring design changes which will

increase costs. This trend has been well documented over the last decade as the demand for a cleaner environment has intensified. The Federal Resource Conservation and Recovery Act (RCRA) of 1976 is one such piece of legislation. California has been a bellweather in environmental legislation for clean air, hazardous waste management, and other programs and currently has many regulations in these areas which are more stringent than those in other states. This trend could be expected to continue, particularly as California's population burgeons.

3.4 Facility Construction Risks

Typically, resource recovery projects have encountered significant delays once a procurement has been finalized, regardless of whether or not the decision is for public or private ownership and operation. There are risks inherent to each procurement approach including A & E, turnkey, modified turnkey, full-service, and modified full-service. Delays can result in greatly increased construction costs and a much different economic scenario for the project than had been forecast months (or years) earlier. Cost overruns, increases during construction caused by poor design data, mismanagement, inflation, the acceptance of a construction cost escalation formula that outstrips inflation and is higher than actual contractor costs, or even a force majeure situation, are always risks; however, they can be reduced or managed to a large extent through sound contracts, performance bonds, and other controls.

If the City is timing the closure of a landfill or other facility with the start-up of a new resource recovery plant, any significant delay could create a disposal problem and engender greatly increased costs for disposal. On the other hand, failure to secure a back-up or residue disposal facility by the time the resource recovery facility is completed could create problems, particularly in the case of Berkeley where a suitable site for ash disposal would have to be secured by plant start-up.

Various risks are associated with project financing such as fluctuating interest rates, i.e., actual interest rate of debt service greater than anticipated, or simply difficulty in meeting the requirements for financing. With the prime interest rate changing so frequently at present, lenders would scrutinize the project very closely and it is not unlikely that the cost of capital could change significantly while financing was being finalized. Berkeley received interest rates of 6 1/4-6 1/2 percent on its last revenue bond issue (1977), but it is certain that higher rates would be charged on the current and near future markets. Berkeley has not voted a General Obligation bond since 1972 and, although the City is far from its bonded indebtedness ceiling (close to \$70 million remains), it appears unlikely that G.O. bonding would be a viable financing alternative in California due to Proposition 13. Since that statute removes the City's ability to increase property value taxes, some other means of levying the additional taxes required by G.O. bonding would have to be established. Given the prevailing public attitudes, this would undoubtedly be difficult.

Changes in laws and regulations relating to construction specifications could also occur and that could increase the cost and delay the project. Lack of adequate insurance on the project, insufficient warranties, consequential and incidental damages due to a contractor's or subcontractor's failure to perform, lack of follow through on parent company guarantees, or simply lack of parent company guarantees, also pose potential risks. Such challenges as patent infringement or unexpected costs might cause delays, or otherwise frustrate the project.

Once the facility is fully constructed, it may be unable to meet acceptance tests such as failure to produce minimum energy outputs, or failure to demonstrate consistent performance at design throughput over a set time period. This often raises issues over the validity of the tests, the language in the acceptance criteria which may have been poorly drafted, or who performs and interprets the tests. There have been cases where projects have been held up for long periods of time when acceptance tests could not be met at the end of the construction

period, and often litigation is required to resolve the problem of who is responsible for certain costs associated with facility performance. Several parties could be involved including the municipality, the system vendor(s), the designer(s), the contractor and various subcontractors.

It is significant to note that in the proposed project there is a risk of permit delay for the facility. There are a myriad of permits which will need to be acquired, perhaps foremost among them is the permit for emissions. Too, public hearings are required for any new source which would exceed 150 lbs./day of any contaminant having limitations such as NO_x, particulates, etc., and there is potential for this project to exceed that limit for some contaminants, particularly NO_x.

3.5 Facility Operation and Management Risks

Once the project is on-line there are many areas where the risk of cost increases can occur: O & M costs higher than projected; quality and quantity of products different than expected; unscheduled outages or excessive downtime; inflation; force majeure situations; regulatory changes; etc. If the facility is owned or operated by a private party, there is the risk that an operator can turn away certain waste streams or fail to accept the waste as planned. Of course, many of these risks can be reduced and managed through a properly structured contract or series of contracts.

Perhaps one of the greatest risks once the system is accepted and in operation concerns the system's reliability and performance. In the system design envisioned for the Berkeley project, it will be important to ensure that such key equipment risks as superheater tube life, turbine downtime, boiler efficiencies, trommel operation, ash quality, and air pollution control equipment are minimized through proper warranties, performance guarantees, or other safeguards. It is important to point out that some vendors will not provide certain guarantees unless they actually operate the system or install specific components.

There are several operational aspects of the proposed project which have been identified as specific risks to be noted at this time. Key among these are the generation of electricity via high pressure high temperature steam and the lack of detailed vendor data on their designs and guarantees for such an approach. The emissions control area also raises some risk considerations. Berkeley is in a non-attainment area and new sources of emissions will be carefully regulated. The system will have to meet Best Available Control Technology (BACT) requirements. To achieve this, a relatively new gravel-bed scrubbing unit has been proposed for particulate removal. Technology for sulfur and nitrogen oxides removal has not yet been identified.

Based on experience with a similar project in North Little Rock, there is potential for the proposed project to exceed the limits for NO_x, and if the emissions exceed 250 lbs./day, an "offset" may be needed in addition to BACT. Additionally, the Bay area is subject to air pollution episodes from time to time, and according to state officials, sources of emissions such as incinerators may be requested to cut back operations or close during such periods. This could seriously affect the project costs if an extended period of ambient air quality deterioration were experienced and waste could not be stored. Further, if the facility had a contract to deliver minimum quantities of energy and could not do so, it might incur a penalty.

The system is projected to have an 85 percent availability and redundant furnace capacity. One turbine has been proposed for installation; however, if down, there would be no ability to provide electricity to the customer until the turbine was repaired. Since the proposed steam customer, California Ink, cannot consume all the steam produced, much of it would have to be condensed during turbine downtime. If the downtime is extended, the project may not be able to meet minimum energy delivery requirements according to contract.

Plant operating and supervisory personnel represent potential risk areas if not qualified for their positions. The skid steer tractor operator who loads the furnace(s) is one of the keys to a successful operation. That person loads the furnaces and controls how well they

operate by the way they are fed. Often, that person also is the only one present during the night shift and may function as the plant supervisor then as well. The plant supervisor is the other critical part of the labor force and must understand the system and be able to react quickly. It is interesting to note that the North Little Rock Project, a resource recovery facility similar to, but smaller than, that proposed in Berkeley, had eight different plant supervisors in the initial eighteen months of operation. One cannot overemphasize the risks posed by lack of trained and dedicated plant personnel.

Other operational risks are posed by a project's inability to meet contractual revenue levels, particularly where there is a revenue sharing agreement between a private operator and the waste supplier (i.e. Berkeley) or where insufficient revenues over a given period would give an operator the right to terminate or delay operations.

Cost escalation due to inflation is always a risk. In many projects, certain cost increases are tied to standard indices such as the CPI, ECI, WPI, Marshall Swift Index, a combination of these or other indices. There is always a risk of inflation lagging or leading these indices. In such cases, the community or the private operator (if a private or full-service type project) would suffer a cost impact depending on which direction inflation was heading compared to the index. Normally, indices are used to reduce or eliminate this problem but they may not track rapid changes in inflation. In California, the inflation rate statewide was about 15.7 percent in 1979 while in the Bay area it was just over fourteen percent. It would be important to examine historical data and current trends when negotiating any contracts involving indices.

Other risks such as liens against the facility, contractor assignment, responsibility for testing during operations, inability of the facility to meet environmental codes, breach of contract, or economic frustration can be considered operational risks although some can actually occur during the construction phase or at the interface of the two phases during shakedown.

In the following section, several specific operation and design risks considered to be critical to this project are discussed in the

context of their cost impacts. In addition, recommended alternatives for reducing them are presented.

3.6 Facility Design Risks

The processing system, as specified, consists of receiving refuse on a tipping floor where a frontend loader will push aside non-processibles for landfill disposal as well as white goods for metal recovery. In addition, corrugated (cardboard) and bulky items (other than whitegoods) which contain metal will be separated and designated for recycling. The percent of non-processibles has been estimated to be 2 percent of the raw refuse, while designated recyclables (white goods, corrugated and other bulky wastes containing metal) have been estimated to be 3 percent of the raw refuse. These figures appear to be reasonable when considering the fact that nearly 1/4 of the refuse delivered to the facility will come from commercial refuse haulers. Typically commercial haulers operating in the same area served by municipal collection vehicles handle commercial accounts (stores, shopping centers, businesses). This waste tends to be higher in corrugated and other bulky metal bearing wastes than household-type refuse alone.

The frontend loader pushes the processible material onto a steel apron conveyor which transports the refuse to a trommel (rotary screen) where it is tumbled in order to break open bags and a 3-way size separation is made. The size separation, as specified, will produce three fractions, minus 2 inch, plus 2 inch x minus 4 3/4 inch and plus 4 3/4 inch. In general, the minus 2 inch fraction will contain glass, stones, dirt and some combustibles, the 2" x 4 3/4" fraction will consist mainly of paper and plastics (combustibles) along with the bulk of the ferrous metals and aluminum, while the plus 4 3/4 inch fraction will be primarily combustibles. The 2" x 4 3/4" fraction will be magnetically separated for ferrous metals recovery and then aluminum cans will be removed by hand in conjunction with a mechanical system. The remainder of the material, essentially combustibles, will be blended with the 4 3/4 inch material as RDF for feeding to the modular incinerators.

When considering the design and implementation of the proposed frontend processing system, there are four basic areas which involve risk. These are the design and effectiveness of the trommel in achieving the desired separation, the generation of incinerator ash vs. trommel residue for disposal, the design of the materials recovery system to assure that marketable products are produced and the design of the RDF storage area to provide for sufficient storage to facilitate the 5 day/7 day operational schedule specified.

For loading out ash residue, it is preferable to provide more than one ash conveying system when multifile combustion lines are to be used in a facility. However, it is not necessary to have one ash conveyed for each module when there are more than two modules. Siting considerations and traffic flow patterns will influence final design.

3.6.1 Trommel

When considering the frontend processing system, as proposed, based on an operating schedule of 8 hours per day, 5 days per week, the design capacity of the trommel is 50 TPH. Assuming a conservative equipment availability of 75 percent, the processing line has a capacity of 300 TPD. Assuming 85 percent availability which should be achievable with this relatively simple frontend process, the daily processing capacity could be 340 TPD. The frontend system will feed four 50 TPD incinerators (only 3 utilized at any given time). These incinerators will operate 24 hours per day, 7 days per week. Hence, the feed rate to the incinerators is no more than 210 TPD on this 5 day/7 day operating basis.

Considering the design capacity of the frontend processing line and its planned 5 day per week, 8 hour per day operating schedule, sufficient excess capacity is available to facilitate the 5 day/7 day schedule as is additional makeup operating time in the event of equipment breakdown.

When considering the actual design of the trommel itself, however, it must be understood that no operational trommel designed to make this 3-way separation is on-line or has been tested on more than a pilot

scale. Up to now, trommels in MSW processing have been utilized to achieve a 2 way separation. Hence, operational data such as capacity and separation efficiencies are available for MSW trommels making 2 way separations but not for 3 way separations. The data on which the proposed installation is based has been supplied by Reynolds Metals Company, Richmond, VA and has been derived from laboratory experiments with a 4' diameter by 12' long trommel. Reynolds has designed a 10' diameter by 40' long unit which has been installed in Houston, Texas but as yet has not been operated. Until the full scale unit, believed to be a 50-70 TPH unit, is operated (startup expected Summer 1980) no confirmation of the laboratory tests will be available. A brief analysis can be made to evaluate the splits anticipated for Berkeley based on both the Reynolds data, New Orleans Recovery I data and particle size distributions of raw refuse which are available.

The Recovery I trommel in New Orleans utilizing 4 3/4 inch diameter holes produces an oversize fraction of approximately 45 percent of the feed. The undersize, 55 percent of the feed, contains about 80 percent of the ferrous metals, 90 percent of the aluminum and 99 percent of the glass. Approximately 1/3 of the organic materials are lost to the undersize fraction, but the heat value of the oversize is 7,100 Btu per pound (dry weight basis) with an ash content of slightly over ten percent (by weight, on - dry weight basis). (1)* (2) (3)

Based on the Recovery I data and raw MSW particle size distributions which are available (4) (5), it is projected that utilizing a trommel with 2 inch diameter holes and 4 3/4 inch diameter holes will yield three products as follows:

minus 2"	20%
2" x 4 3/4	35%
plus 4 3/4	45%

The 2" x 4 3/4" fraction will contain 75-80 percent of the ferrous metals and 85-90 percent of the aluminum while containing a low amount of the glass. The bulk of the glass will report with the minus 2 inch fraction.

* See pages 65-66 for the complete reference.

In contrast to this projected separation, the Reynolds Metals Co. experimental unit in Richmond, VA produced the following results (6):

minus 2"	28%
2" x 5"	28%
plus 5"	44%

These values indicate that substantial breakage of materials such as glass occurred in the trommel thus increasing the amount of minus 2 inch material.

The projected separation for the proposed project is as follows:

minus 2"	24%
2" x 4 3/4"	25%
plus 4 3/4"	51%

These figures reflect the projected split made by the trommel when considering the actual feed to the trommel (nonprocessibles and designated recyclables removed). Based on the New Orleans Recovery I data and the Reynolds experiments the amount of plus 4 3/4 inch fraction appears to be high. However, the minus 2 inch fraction appears to be in order, hence, any difference in the plus 4 3/4 inch fraction will result in an increase in the 2 x 4 3/4 inch fraction which is also incinerator feed. This difference will have little, if any effect on the process. As a result of this analysis, it appears the greatest risk lies with the actual sizing of the trommel required to handle 50 TPH and to perform the desired separations.

A trommel has been tested and proven at New Orleans. Empirical data are available for sizing a trommel to process raw MSW to make a 2 way separation (plus and minus 4 3/4 inches). The introduction of a second smaller hole size to accomplish a 3 way separation will increase the trommel length required to achieve a similar separation efficiency. Because a smaller fraction of the total feed will pass the smaller holes, additional chances for passage must be afforded to the particles. Reynolds Metals Co. has selected a 10 feet diameter unit with 40 feet length of screening area for the Houston pilot operation. The first 16 feet contain 2 1/4 inch diameter holes and the remaining 24 feet contain 5 inch diameter holes. Reynolds believes the unit will be

capable of processing at least 50 TPH of MSW. It must be noted that Reynolds' goal for the operation of the trommel is to optimize aluminum can recovery in the 2 1/4 x 5 inch fraction. Removal of glass and other high ash content material to the 2 1/4 inch fraction is secondary. Hence, the 5 inch screen section is the longest to make sure few aluminum cans are lost to the plus 5 inch fraction.

The proposed Berkeley Project is designed basically for energy recovery. Materials recovery is also included. In addition, removal of ash from the fuel fraction is necessary to enhance operation of the energy recovery incinerators, and also to minimize the amount of incinerator residue produced which must be disposed of in a special sanitary landfill operation. Because of these factors, the amount of glass and other high ash components in the plus 2 inch fuel fraction should be minimized. When operating results become available from the Houston operation, the ratio of the two lengths of screen cloth should be re-evaluated to assure that the outputs are consistent with the design goals of the Berkeley Project. The Berkeley facility may require a different ratio. In addition to separation efficiency information, the Houston pilot facility will demonstrate the throughput capabilities of the trommel for the 3 way separation. When final design and selection of a trommel is made for the project, it should be noted that an incorrect screen cloth selection on a 10 feet diameter by 40 feet long trommel will cost approximately \$40,000 to replace (current price, March 1980).

Additional data which should be obtained from the Houston facility prior to final design of the proposed project are the heat values and ash contents of the various trommel fractions.

3.6.2 Incinerator Ash vs. Trommel Residue Disposal

It is important to note that waste is classified by the State Department of Health as hazardous or nonhazardous. Once classified, the appropriate regional water quality control board decides in what type of facility the waste can be disposed or processed. In the case of incinerator ash, the general classification is Group 1 hazardous waste

requiring disposal in a Class I (hazardous waste disposal site) "unless the producer can show that it will not violate water quality regulations", in which case it might be approved by the RWQCB for disposal in a Class II-1 site which has leachate control but less stringent requirements (and usually an attendant lower tipping fee) than a Class I facility.

The burden of proof that the incinerator residue is not hazardous or otherwise is acceptable for disposal at facilities other than Class I sites is upon the waste generator or system operator, i.e., the City of Berkeley or its contracted operator or other facility owner/operator, and a final determination of that acceptability cannot be effected until the system is on-line and the residue subjected to appropriate testing (unless a reversal in the present position of the State Health Department and the RWQCB is made before such time as the system would be implemented).

One of the critical variables in approving the residue for disposal in other than a Class I facility will be its moisture content, since the RWQCB desires to limit the disposal of high moisture content wastes which could solubilize metals and other materials creating levels of water contaminates exceeding approved limits.

This is one of the most significant risk areas in the proposed project and should be carefully considered in the planning and procurement stages of the project. Current charges for landfill disposal of Group I waste (hazardous incinerator residue) are reported to be 3 to 5 times as much as Group II non-hazardous wastes such as trommel and other process residue. Therefore, it is imperative to minimize the amount of incinerator residue produced.

Trommel undersize (minus 4 3/4 inch) produced at Recovery I has a bulk density of approximately 20-22 pounds per cubic foot (600 pounds per cubic yard). It is estimated that the minus 2 inch material produced from the proposed facility will have a bulk density of 800 pounds per cubic yard. Current landfill costs of this material are \$6.85 per ton (not including transportation).

Incinerator residue as removed from the quench tank of conventional mass burning and modular incinerators typically has a bulk density of 1,000 to 1,500 pounds per cubic yard. (7) (8) The incinerator residue will have a moisture content of approximately 35 percent. Dry incinerator residue has a bulk density of approximately 600-700 pounds per cubic yard. (7)

Although a U.S. EPA sponsored evaluation of modular incinerators indicates that one particular installation produced ash with a bulk density of 1,500 pounds per cubic yard (8), a manufacturer reports a bulk density of 1,000 pounds per cubic yard (9). In addition this is confirmed by a U.S. Bureau of Mines evaluation of incinerator residue from six facilities. The bulk densities ranged from 820 to 1,627 pounds per cubic yard with an average of 1,057 pounds per cubic yard. Average moisture content was 36.7 percent (7). On this basis, it would appear that in order to be conservative in the design of the residue handling system including landfill disposal, a bulk density of 1,000 pounds per cubic yard should be utilized if raw refuse is being fed into the incinerators. If trommeled refuse is fed into the incinerators with the bulk of the glass and stones removed, the bulk density of the resulting incinerator ash would decrease. Again, based on U.S. Bureau of Mines data, this bulk density could be as low as 700 pounds per cubic yard if essentially all glass is removed. The glass, stone and brick component of incinertor residue has a bulk density of approximately 2,000 pounds per cubic yard. Hence, its removal has a great effect on incinerator residue density. The bulk density of the residue will be an unknown until the facility is actually on-line. Thus, design considerations must utilize conservative figures.

It would appear that the cost of residue disposal could be one of the highest operating costs incurred by the proposed facility if the incinerator residue must be disposed of by itself classified as a hazardous waste. As proposed, the trommel undersize material is to be blended with the incinerator residue to hopefully allow for lower cost disposal once the system is on-line.

The trommel residue is estimated by the project engineer to be 23 percent by weight of the raw refuse received by the plant while the amount of incinerator residue is said to be 9 percent of the raw refuse received. The trommel figure is reasonable and in agreement with the previous discussion on trommeling. However, the incinerator residue figure seems very low. Although the ash content of the fuel product is likely to be 13 percent (provided by project engineer), modular incinerators do not provide complete burnout of the refuse. Burnout is estimated to be only 90 percent. When taking into account the fuel product moisture and ash contents, 30 percent and 13 percent respectively, the 90 percent burnout of the fuel fraction and the 35 percent moisture content of the wet residue, the incinerator residue is 23.4 percent (wet weight basis) of the feed to the incinerators. Assuming the fuel product is 68.4 percent of the raw refuse delivered to the facility (provided by project engineer) the incinerator residue is 68.4×23.4 or 16 percent of the raw refuse delivered to the plant. On this basis the trommel residue and incinerator residue will be blended on a ratio of 23 to 16. On the basis of 68,000 tons per year of refuse delivered to the facility, 15,640 tons of trommel residue will be produced and 10,880 tons of incinerator residue will be produced. This is a total of 26,520 tons of total residue per year which must be disposed of. If the bulk density of trommel residue is 800 pounds per cubic yard and the bulk density of the incinerator ash is assumed to be 1,000 pounds per cubic yard, the total volume of plant residue will be 60,860 cubic yards per year. Costs of plant residue disposal should be calculated on the basis of this conservative estimate.

3.6.3 Materials Recovery System

It is proposed that ferrous metals and aluminum recovery be implemented on the trommel mid-size (2" x 4 3/4") material prior to incineration. Ferrous metals will be recovered by a multi-pole belt type magnetic separator and aluminum recovery will be accomplished by a recently developed mechanical device in conjunction with handpicking. The

magnetic metals in the trommel mid-size fraction will be primarily beverage cans while the magnetic metals remaining in the trommel oversize fraction will tend to be the heavier ferrous metals.

The proposed multi-pole magnetic separator has been utilized in a number of resource recovery facilities and is proven to be effective in removing magnetic metals from waste streams. However, in most instances, the separator alone has not been effective in meeting the market specifications for recovered ferrous metals. It is important to produce a clean magnetic metal fraction meeting the bulk density requirements of the specific market. From the data and information supplied by the project engineer, the market for Berkeley ferrous scrap will be either detinning or copper precipitation. Both markets have similar specifications and hence one processing system can be designed to meet the needs of both. A copy of the recent industry-adopted ASTM Standard Specification for Municipal Ferrous Scrap is included for reference in Appendix A.

Recovery I in New Orleans initially installed a single magnetic separator to produce a steel can fraction for sale to the scrap industry for detinning prior to use in copper precipitation. Problems were continually encountered in providing a sufficiently organic free product as well as in meeting minimum carload quantities due to insufficient bulk density. As a result, severe penalties were imposed by the purchaser. In order to overcome the inability to have customer requirements, a metal shredder and secondary magnetic separation system had to be installed (10).

As a result of Recovery I experience and first hand knowledge of the consultant, a metal shredder and secondary magnet should be included in the system. Unless this is done, organic contamination will be higher than permitted by the markets and bulk density will be very low. Market requirements call for 25 to 30 pounds per cubic foot, while the whole cans recovered without shredding will have a bulk density of 10 to 12 pounds per cubic foot. Hence transportation costs will be much higher even if the market accepts the product.

Since the magnetic metals contained in the trommel oversize will tend to be heavy ferrous and since all bulky wastes are to be removed on the tipping floor, it is not deemed appropriate to recover magnetic metals from the oversize. The equipment required to handle the material must be much larger than for the mid-size fraction and in addition further processing (such as air separation) is required for it to be marketable. Unless the cost of incinerator ash disposal warrants removal of this material to reduce ash volume, it is not recommended.

To make further use of the metal shredder and secondary magnetic separator and to increase aluminum recovery revenue, the aluminum cans which are handpicked into bins should be shredded and magnetically separated at a time when the remainder of the front-end system is not in operation. By shredding and magnetically separating the aluminum, its bulk density will be greatly increased resulting in handling and transportation savings, and also, tramp steel cans, which are serious contaminants in the aluminum will be removed. Note that the Reynolds Houston installation will be recovering aluminum in a manner similar to the proposed facility. Once on-line it should be examined to include the latest developments in the Berkeley design.

3.6.4 Space Consideration for RDF Storage

Recovery I reports that trommel oversize material (+4 3/4") has a bulk density of approximately 5 pounds per cubic foot. Bulk density of the minus 4 3/4" fraction is reported to be approximately 22 pounds per cubic foot. Removal of the minus 2 inch fraction will likely reduce the bulk density of the 2" x 4 3/4" fraction to about 15 pounds per cubic foot. Using the ratio of minus 4 3/4" to plus 4 3/4" provided by the project engineer, the calculated bulk density of the fuel fraction would be approximately 8.4 pounds per cubic foot. Considering that the RDF will be stacked with a front-end loader, the packed density will be about 12 pounds per cubic foot. Higher packed densities have been reported for RDF, but these are from facilities with shredded RDF having a top size of 3 to 4 inches. Since the plus 4 3/4 inch fraction is unprocessed, this will reduce the overall density.

Approximately 10,000 square feet is available for RDF storage (provided by project engineer). For ease in handling the material, the depth will average 8 to 12 feet. Hence, storage volume available is 80,000 to 120,000 cubic feet. At 12 pounds per cubic foot, the storage area can hold 480 to 720 tons of RDF. This is sufficient storage capacity for 2.4 to 3.6 days of incinerator feed. Hence, it should be sufficient for the 7 day/5 day per week operating schedule as proposed.

3.6.5 Energy Recovery System

The RDF produced by the frontend processing system will be fed to modular incinerators for superheated steam production which will be used to generate electricity. In addition, some lower pressure steam will be extracted for sale to a nearby industry. Three of the four incinerators installed will be operated 24 hours per day, 7 days per week. Hence, one incinerator will be available as a backup at all times.

When considering the proposed Berkeley installation of modular incinerators for electrical power generation there are several risk areas which must be considered. These are the ability and reliability of modular units to produce superheated steam, potential problems with co-generation by modular incinerators and air pollution control.

Modular Incinerators for Superheated Steam Production

As indicated by the project engineer, the proposed facility will produce superheated steam at 600 psig and 550°F. This requires approximately 65°F of superheat. Discussions with several modular incinerator manufacturers indicates a willingness to provide equipment meeting these steam requirements. (11) (12) In fact, a willingness to supply equipment for superheated steam production up to 600 psig/700°F was indicated. However, it must be noted that corrosion rates accelerate tremendously as the degree of superheat is increased.

Most information on superheater corrosion when firing solid waste has been derived from the Nashville installation. One system vendor, Consumat, feels that its modular equipment is in a much better position

from a corrosion rate standpoint since the superheaters will not be located in as high a temperature zone as in the waterwall units. Hence corrosion rates should be somewhat lower in the modular units. Consumat feels that the life expectancy of superheater tubes in an installation such as Berkeley will be 2 years.

Experience at Nashville where massburning MSW is producing 400 psig, 600°F superheated steam has shown that the first set of superheater tubes failed after 2,200 operating hours (equivalent to 92 days). Failure occurred in the area of the soot blowers. With the second set of superheater tubes, soot blowing frequency was reduced from once per day to once every four to seven days. This second set experienced a life of 10,000 operating hours (equivalent to 416 days). The third set installed in January 1979 is expected to last more than 20,000 hours (equivalent to 832 days), since metal thickness was increased more than twenty percent. (13)

Actual operating experience from Nashville is what most manufacturers are utilizing for their superheater tube life estimates. Since the temperature is 600°F, it is actually 50°F additional superheat above that specified for the Berkeley Project. Hence, life expectancies at Nashville should be conservative figures on which to estimate superheater tube life.

It is generally agreed throughout the waste-to-energy industry in the U.S. that for the most efficient energy recovery operation without excessive maintenance, the operation should not exceed 600 psig, 750°F superheated steam. In addition, the superheaters should be located away from the radiant furnace in an area of greatly reduced gas temperatures not exceeding 1,100 to 1,200°F. There particle abrasion and slagging will be minimized. It is this type of zone that would be more available in a modular type unit than a waterwall unit. Continuous superheater operating experience of 35,000 hours under these conditions has been logged in Europe. (14) (15)

It should be noted that removal of glass and metals prior to incineration should provide a benefit in lowering particulates and slag-

ging around the superheaters and should aid in extending superheater life. As a result of all these factors, it appears that the steam temperature and pressure combination selected for Berkeley should provide for a reliable operation and reasonable superheater life expectancies.

Some modular incinerator manufacturers (Consumat and Basic) report that the capital cost of replacing a superheater section in a boiler of the size to be utilized in the proposed project would be \$50,000 to \$60,000 per energy recovery unit. On the basis of a 10,000 hour life experienced on the second set of superheaters at Nashville and considering four units installed with each operating 3/4 of the time, it is reasonable to expect at least a 1.5 year life assuming a 7 day per week, 365 days per year operation. In the event that a 20,000 hour life can be achieved, as projected at Nashville, life expectancy would be extended to 3 years each.

Assuming a 1 1/2 year life utilizing 4 units operating 3/4 of the time, the capital cost of superheater replacement would average \$135,000, to \$160,000 per year for the system (\$1.99 to \$2.35 per input ton to the facility based on 68,000 TPY). In the event that superheater life can be extended to 20,000 hours, the capital cost of replacement would be reduced to an average of \$67,000 to \$80,000 per year (\$0.99 to \$1.18 per input ton).

Cogeneration with Modular Incinerators

The project has been designed to produce superheated steam (600 psig, 550°F) to drive an extraction condensing turbine to produce electrical power while allowing for 150 psig steam to be extracted for sale to a nearby industry. Although steam and electricity will be produced 24 hours per day, 7 days per week, the low pressure steam will be extracted only 24 hours per day, 5 days per week.

Since steam production is expected to vary somewhat due to waste quantities and heat value of the waste, it is necessary to be assured that the turbine can handle variable loads.

Review of this situation with several turbine manufacturers indicates that load reduction up to 50 percent of design capacity will not affect the turbine operation. Hence, if the turbine is designed for 40,000 pounds of steam per hour and this is reduced to 20,000 pounds per hour of steam, no problems should occur. The governors and control system will be specified and selected accordingly. However, due to the design of the facility, steam production variations should rarely, if ever, decrease by 50 percent.

The main concern for the turbine design is the steam inlet temperature and pressure and the extraction pressure. The turbine is designed to sustain the full rated steam output with or without extraction. Since 150 psig steam is the extraction pressure required to supply the steam customer 5 days per week, substantially less electrical power will be generated week days than on weekends. As indicated by the project engineer, 14 pounds of steam will be required per kwh when no steam is extracted, while extraction will require 50 pounds of steam per kwh. The only thing which can be done to improve the energy recovery efficiency and increase electrical power generation is to increase the temperature of superheated steam production. The projected revenue stream must be checked and heavily weighed against the increased superheater replacement costs and downtime projected at the higher operating level. Depending on the continued operating experience at Nashville, it might be beneficial to evaluate the possibility of raising the steam production temperature.

3.6.6 Air Pollution Control

Present design costs are to be developed based upon the consideration of using a Combustion Power Co. (CPC) electroscrubber for air pollution control of particulates. This unit is a granular-bed filter containing an electrostatic grid. The units have been utilized on wood-burning boilers, pulvetized coal burners, at a steel mill for coke calcining and a lime kiln. Pittsfield, MA plans to use a 90,000 cfm electroscrubber for a solid waste incinerator.

Although the unit has proven to be quite effective and meets applicable air pollution codes on present applications, it has not been utilized on a solid waste incinerator as of this time. The Pittsfield unit will not be on-line for more than a year, hence, no data will be forthcoming on which to directly evaluate the unit for sometime.,.

In the meantime, CPC has a mobile test unit available which could be taken to the site of a similar modular incinerator for testing. In light of the lack of experience of this unit on solid waste incinerators, it might be appropriate that testing be conducted with the test unit prior to selection and sizing. It should be noted that field testing of mobile electrostatic precipitators was recently performed at an existing reciprocating grate stoker-fired municipal incinerator in Dearborn Heights, Michigan to evaluate air pollution control equipment. There, pilot tests were conducted to evaluate the Elektrofil and Hydro-Precipitrol wet electrostatic precipitators (16).

An additional air pollution control consideration when evaluating the proposed facility concerns the incinerator dump stacks. No provision has been made to remove pollutants from the off-gases in the event of a boiler failure requiring steam production to be halted while operating the incinerators.

Although temporary emission excursions are permitted by air pollution codes, it should be noted that complete burnout and shutdown of these incinerators requires several hours. An excursion of this length may not be permitted. As a result, the design should include tying in the dump stacks to the air pollution control system by means of a cooling chamber, or the boilers should be manifolded together to allow for the rapid switching of the hot gases to another boiler for heat recovery in the event of a boiler failure. In this way, the gases will be channeled to the air pollution control system.

4. STRATEGIES FOR RISK ALLOCATION AND MANAGEMENT FOR BERKELEY

In the previous section of this report, risks specific to the Berkeley project are identified and discussed. These major risk areas are presented in Table 2. These risk areas can be translated to uncertainties related to:

- Project economics;
- Energy market(s) commitment/viability;
- Waste supply assurance;
- Alameda County approval; and
- More attractive alternative projects.

The economics, as thus far presented, indicate a project with high capital costs and a substantial gross operating cost. Offsetting these costs are substantial revenues which have not yet been confirmed as a result of binding negotiations with particular energy users. Additionally, there exists a major uncertainty related to the cost of ash disposal. The economic statement prepared to date does not consider fees for private construction, operation, and alternative financing arrangements.

4.1 Alternative Procurement Approaches*

There exist several methods for procuring resource recovery facilities and for their operation. These methods have been discussed in detail in a report previously issued to the City.

Resource recovery procurement is a process by which decisions made in the selection phase regarding system type are systematically translated into an operational facility. This process involves contractor selection, contract negotiation, facility construction, and operational testing. Because the process tends to be both legally and administra-

* This discussion was derived mainly from "Procurement Strategies, Choices, and Contractual Methods Explored" by P. Aarne Vesilind and Dennis Warner, Solid Waste Management, April 1978.

TABLE 2
MAJOR RISK AREAS FOR THE BERKELEY PROJECT

- Waste Supply
 - Source Separation Impact
 - Competing Local Resource Recovery Projects
 - City of Alameda
 - West Contra Costa Resource Recovery Facility
 - Davis Street Transfer/Resource Recovery Facility
- Energy Users for Steam and Electricity
- Disposal Risks
- Facility Construction
- Facility Operation and Management
 - Specific in Proposed Design
 - Trommel Split
 - Incinerator Ash vs. Trommel Residue Disposal
 - Materials Recovery System
 - Space for RDF
 - Modular Incinerator for Superheated Steam
 - Cogeneration Performance
 - Air Pollution Control Performance

tively complex, a carefully considered procurement strategy is essential for successful implementation.

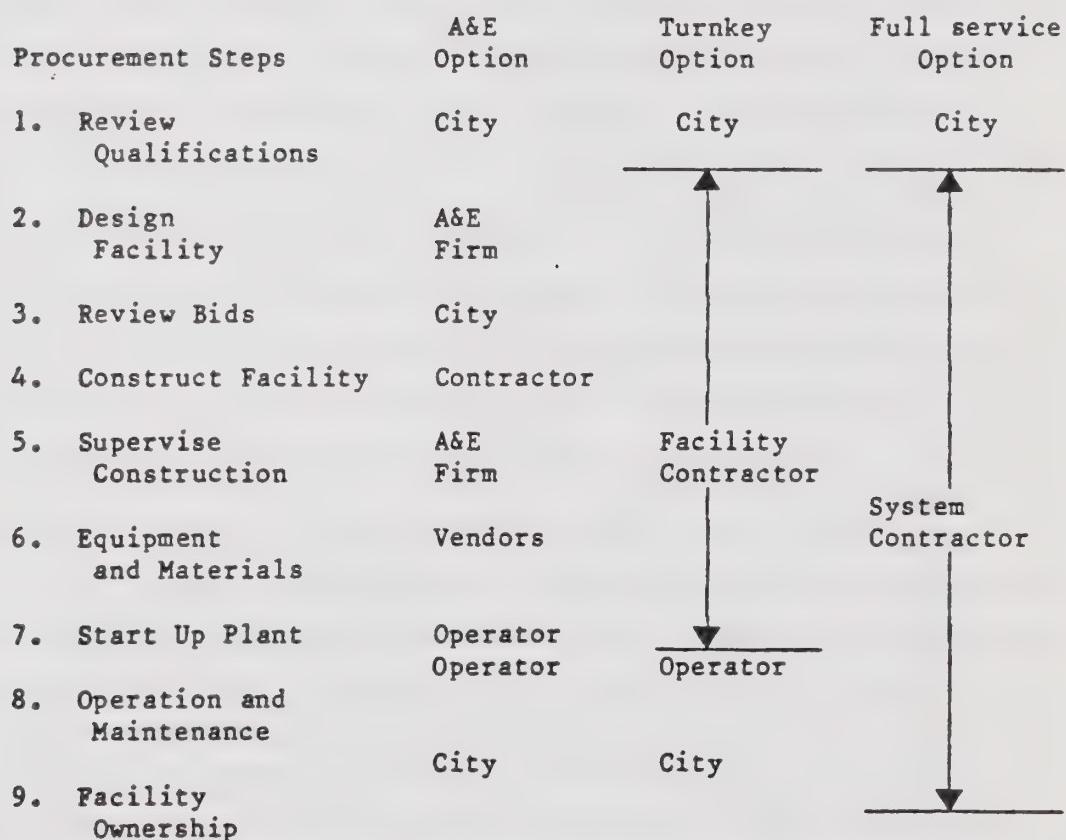
There are three basic strategies, or procurement options, that can be followed, as shown in Figure 1. The first is the traditional architect-engineer approach (A&E); the second is the turnkey approach and the third is a full service approach. There are, however, potential modification to each approach. The choice of one strategy over the other depends largely upon the issues of ultimate facility ownership, the allocation of risks between the city and private contractors, legal restrictions, and the availability of financing.

The A&E approach is the strategy cities have traditionally used to procure sewer systems, roads, schools, and other public works. It normally involves two separate procurements -- one for engineering services and another for facility construction. Initially, an A&E firm is selected on the basis of its past experience and present capabilities in the general type of resource recovery system desired by the city. The firm draws up the final engineering designs and helps the city to prepare an invitation for bids (IFB). The city then reviews the bids submitted by contractors and awards a contract for the construction of the facility on the basis of lowest cost. In the A&E approach, the consulting engineers often provide continuing services to the city in the form of construction supervision and monitoring of final plant shakedown.

An alternative procurement option is the turnkey approach, in which the city contracts with a single contractor for a complete package of facility design, construction, equipment supply, and start-up. The contractor is required to satisfy various acceptance criteria in turning over to the city a fully operating facility. A modification of this option is to have the contractor also operate the facility for the city. Turnkey contracts usually are awarded on the basis of a request for proposals (RFP) issued by the city. An RFP states in general terms the type of system wanted by the city and allows interested contractors the opportunity to propose comprehensive, and possibly unique, solutions for which they have special capabilities.

FIGURE 1

RESOURCE RECOVERY PROCUREMENT RESPONSIBILITIES UNDER THREE DIFFERENT ACQUISITION STRATEGIES



Source: Ibid, A. Vesilind, D. Warner

The third option is the full service approach involving total implementation, operation, and ownership by a private firm. As in the case of the turnkey option, the city issues an RFP, but the contract is for a resource recovery service instead of a plant. The selected contractor is responsible for project financing, design, construction, equipment supply, start-up, and subsequent operation of the facility. Being the owner of the plant, the contractor will earn revenues from the sale of recovered products and from specified dump fees charged the city over a minimum period of 10 to 20 years.

Successful cases of all three types of contracting strategy can be found. One of the first to use the A&E approach was Ames, IA, which since 1975 has had a fully operational 200 TPD system producing refuse derived fuel, baled paper, and metals. On the other hand, Bridgeport, CT, adopted the modified turnkey approach and expects next year to have an 1,800 TPD plant producing refuse derived fuel, metals, and glass. The full service approach is well illustrated in Saugus, MA, where a 1,200 tpd plant producing steam and magnetic materials has been serving ten communities since 1975.

Within the context of the three procurement options, there are two basic methods for reaching contractual agreements between the city and the suppliers of services, facilities, and equipment. The first method can be termed competitive procurement, because it utilizes formal advertising and the selection of the lowest responsive bid according to well-defined specifications. Since it is the traditional method used in the A&E approach, competitive procurement is a widely used procedure in public works implementation and is well understood by city personnel.

The competitive procurement method begins with an examination of the qualifications of A&E consulting firms by the city. The selected firm normally is chosen on the basis of its relevant resource recovery experience, the type of recovery system desired by the city, and the results of negotiations between the city and the firm. This portion of

the competitive procurement method is not price competitive, although the remainder of the process is. The consultant then carries out final system designs and helps to prepare an IFB containing detailed specifications of the type of system desired. The resulting bids from potential contractors are price competitive, since they are evaluated on the basis of both technical merits and cost.

The second method for arriving at contracts is termed negotiated procurement, and it applies primarily to the turnkey and full service procurement approaches. Negotiated procurement has not been widely used in the acquisition of public works, and it occasionally runs into restrictions from state laws requiring competitive bidding on the basis of price. Although competitive procurement is well suited to systems which can be clearly specified in advance, a growing number of state and local governments are coming to realize that negotiated procurement is far more effective in the acquisition of systems whose technology, markets and operations contain many uncertainties at the time of contract negotiations.

The heart of the negotiated procurement method is the request for proposals (RFP), which generally solicits bids on the basis of specifications more broadly drawn than those in an IFB. In general, an RFP for a turnkey approach will contain more technical detail than one for a full service option. Nevertheless, the use of an RFP shifts much of the design responsibility to the contractor and, hopefully, provides the city with a wide range of proposed technical solutions. Following proposal evaluation, a winning contractor (or set of finalists) is selected and the city then enters into contract negotiations with this firm. Any necessary deviations from the RFP must be considered at this point. Furthermore, the contract should contain sufficient flexibility to allow the contractor to adjust to unanticipated technical and financial changes in the systems. Without this flexibility, the increased risks borne by the contractor will be reflected in higher contract costs to the city.

4.2 Implementing Agency's Philosophical Posture

The implementing agency's philosophical posture is very important to consider in determining which procurement approach that will be undertaken. Remembering that the primary purpose for undertaking a resource recovery project is to provide for the sound disposal of solid waste without creating a public health hazard or an environmental pollution problem, municipal officials are faced with deciding between traditional and nontraditional approaches.

Resource recovery companies exist which are willing to provide equipment and/or services to address municipal needs under any conceivable project structure that can be effectively applied. Various projects have been implemented under very different structures reflecting the posture of the local officials as well as the availability of alternatives that are believed to exist.

City officials will need to decide what degree of control they wish to have in maintaining the public health aspects of solid waste disposal, either directly or through contracts for service. Similar decisions will need to be made regarding which capital financing vehicle the City can go through. The availability of financing approaches and mechanisms does affect the procurement decision. Similarly the City must make decisions related to the degree of support it will commit over the life of the project for the operations -- either through commitment of certain minimum quantities of solid waste or through a guaranteed payment for receiving the service of disposal through recovery.

Basic to these decisions is the degree of control the City would like to maintain over the facilities' operations. For direct control, the City should maintain ownership. The control is less direct if ownership does not lie with the City. If adequate capacity for sanitary landfill exists in the future and at a reasonable cost -- less than projected at this time for resource recovery -- then it may be advisable to allow others to own the facilities. If problems arise, disposal could be provided by sanitary landfilling directly.

As discussed earlier, even if publicly owned, the facility can be privately operated as well as designed and constructed by the same entity. As public agencies usually have less flexibility to hire/fire

staff resources, consideration to this posture may become a necessity for the operation of resource recovery equipment.

If strong sentiment for supporting recycling operations exists, there can be a reluctance to enter into contracts or to support facilities which need/require waste for processing. Oftentimes, the encouragement of recycling gets in the way of moving forward with resource recovery. This is an unfortunate circumstance, as both disposal reduction techniques can work simultaneously as long as both activities recognize the ramifications of the other. Neither approach can work without financial support from a City or ordinances which require either separation of wastes for recycling or of delivery of waste collected for processing. With a resource recovery project, no City can expect a project to meet both technical and economic objectives unless a predictable level of solid waste can be supplied.

4.3 Small System Procurement Experience

A growing number of small resource recovery systems are being planned and implemented. The experiences of the projects that have moved forward into construction and operation phases are reviewed briefly here to provide perspective. Presented in Table 3 is a listing of twelve localities that are either operating or constructing small modular units. The procurement methods followed by these localities are summarized as follows:

As can be seen, the A&E approach has most often been used in the procurement of small systems. However, two recent procurements-Auburn, Maine and Pittsfield, Massachusetts--and North Little Rock's recent award of the operating contract to Consumat Systems Inc. indicate a new trend in municipal procurement of small systems as well.

A review of the decision making process in these locations is presented here for background purposes.

4.3.1 North Little Rock

In 1971, North Little Rock purchased two small incinerators (12.5 tons per day per unit) without energy recovery capability to handle their growing volume of solid waste. However, the units were never

TABLE 3
MODULAR COMBUSTION PROJECTS

The following localities are either operating or constructing small modular combustion units to produce steam from mass combustion of municipal solid waste:

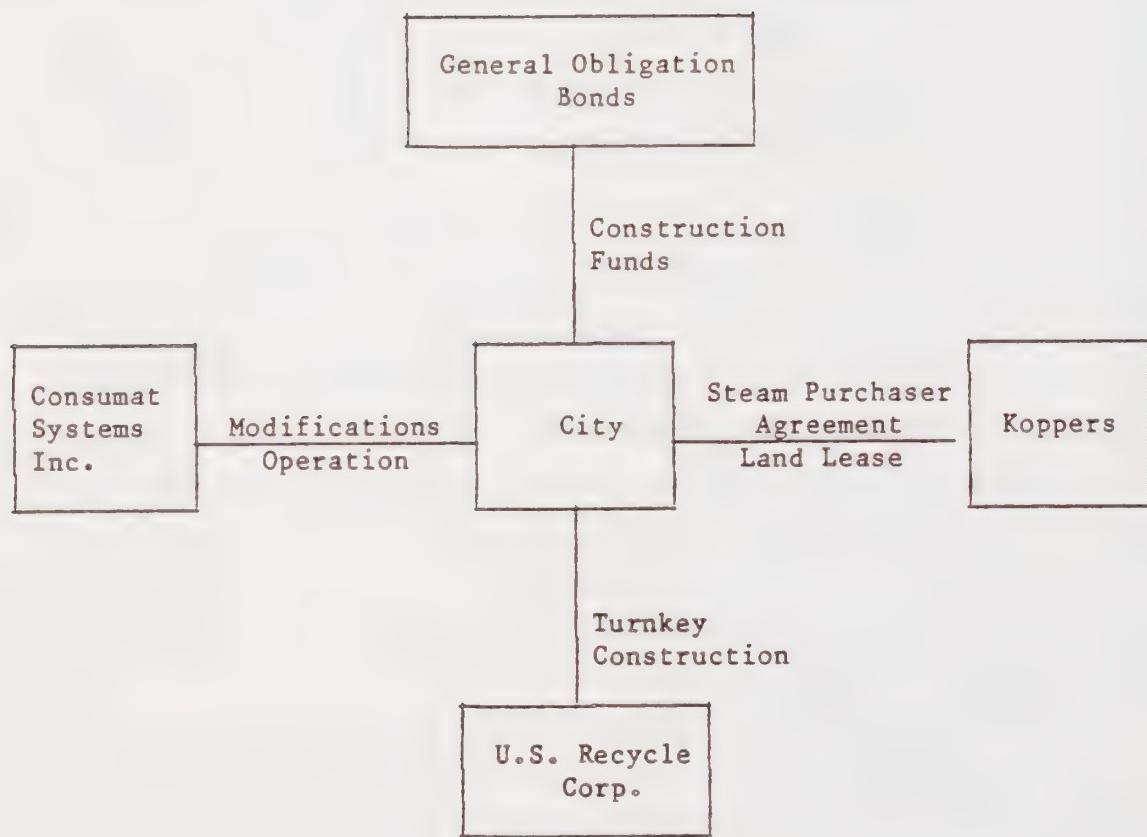
LOCATION	MANUFACTURER	REPORTED CAPACITY (TPD)	REPORTED CAPITAL COSTS (MILLIONS OF \$)	STATUS	CONTACT
Auburn, Maine	Consumat	150	3.2	Design contract, funded by DOE, signed, energy use and operator contracts signed, construction began Aug. 1979, startup planned for Nov. 1980	Robert Belz Public Works Auburn City Hall 45 Spring St Auburn, Maine 04210
Blytheville, Ark.	Consumat	75 to be processed	N/A	Temporarily shut down for installation of additional units	Tom Little, Mayor City Hall Blytheville, Ark. 72315
Crossville, Tenn.	Smoketrol	60	1.11	In shakedown; undergoing modifications	Nelson C. Walker Gen. Mgr. Environmental Services Corp P.O. Box 765 Crossville, Tenn. 38555
Dyersburg, Tenn.	Consumat	100	2	Under construction; startup scheduled in early 1980	Alderman Bob Kirk Colonial Rubber Dyersburg, Tenn. 38024
Genesee Township, Mich.	Consumat	100	2.0	Began operations in Feb. 1980	Hanumanthaiya Marur, P.E. Township Engineer 7244 North Genesee Rd. Genesee, Mich. 48437
Groveton, N.H.	Environmental Control Products	24	N/A	Operational since 1975	Rick Coville Groveton Paper Mill, Inc. Groveton, N.H. 03582
Lewisburg, Tenn.	CICO	60	N/A	Under construction; to be in operation in July 1980	John D. Lambert City Manager 505 Ellington Pkwy., Rt. 1 Lewisburg, Tenn. 37091
North Little Rock, Ark.	Consumat	100	1.45	Operational 1976-1979; presently undergoing modifications. City awarded contract to Consumat Systems, Inc., for modifications and long-term operation; scheduled to re-open in March 1980	Mike Butner President U.S. Recycle Corp. P.O. Box 7561 Little Rock, Ark. 72217
Osceola, Ark.	Consumat	50	1.1	Began operations in Jan. 1980	R.E. Prewitt, Mayor City Hall Osceola, Ark. 72370
Pittsfield, Mass.	Vicon Recovery Assoc. (Enercon designed incinerators)	240	6.2*	Construction to be completed in Sept. 1980	Joseph J. Domas, Jr. President Vicon Recovery Assoc. P.O. Box 100 Butler Center Butler, N.J. 07405
Salem, Va.	Consumat	100	1.9	Operational in 1979	William Paxton, Jr. City Mgr. P.O. Box 869 Salem, Va. 24153
Siloam Springs, Ark.	Consumat	16	.4	Operational since Sept. 1975 (Presently being used as incinerator only)	Al Varwig, Dir. Sanitation Dept. 410 North Broadway Siloam Springs, Ark. 72761

installed because of political problems relating to siting. In 1974, U.S. Recycle Corporation, a franchised dealer of Consumat Systems, Inc. proposed that the City operate a modular incineration system with energy recovery and that it sell the steam produced from the system to a potential market--Koppers Company. After favorably receiving a U.S. Recycle study which included a discussion of potential project economics, along with positive discussions with Koppers regarding the apparent feasibility of a Consumat System meeting steam requirements, the City decided in 1975 to pursue the energy recovery system. From 1976 to mid-1977 contracts were negotiated and the facility was constructed. In September 1977, the City began operating its own modular incineration system that was contractor-designed and constructed. The turnkey approach was not operating to the City's satisfaction, however, and in March of 1980, the City turned over the operations of the facility to Consumat [Figure 2].

The City had determined that it would own and operate the facility from its start. However, Consumat assumed responsibility for the daily operation of the facility when it was determined that City personnel were not properly carrying out required tasks. Under the new arrangement, the City receives all revenue from steam sales and pays Consumat a flat fee for facility operation. Consumat assumes all risk for the quantity of materials required for daily operations. The operating contract is limited to one year due to state law, but it appears that Consumat's direction of operations will continue at least until the steam contract with Koppers terminates.

In selecting the contractor, the City was required by state law to carry out competitive bid processes except in "exceptional situations where such procedure is deemed not feasible or practicable". The RFP was very detailed in that it included proposer qualifications criteria in the bid package for the design, construction, and equipping of the facility. Proposers had to have had at least two years of demonstrated experience providing similar systems for processing municipal refuse and with at least two projects involving municipal solid waste processing and in providing steam to a user which required a uniform and uninter-

FIGURE 2
NORTH LITTLE ROCK CONTRACTS



rupted supply of steam. The RFP was released in November 1975 and contract negotiations were culminated in April 1976. U.S. Recycle/ Consumat, the selected contractor proposed a fixed price for the equipment, supervision of installation, the training of City employees during the first year of operation and equipment testing at the end of one year to determine performance quantites. Project costs were financed from a special revenue bond issue and from available city funds.

The city retained a local engineering firm to prepare plans and specifications for plant building construction and equipment installation. U.S. Recycle also provided assistance in the preparation of specifications and offered to meet with each prospective bidder to describe the Consumat equipment installation requirements in order to aid in the bidder's cost estimates and guarantee proper installation. Bids were opened in early June 1976 and a contract was awarded to the lowest bidder two weeks later.

In June 1976, the City and Koppers signed contracts for the purchase of steam, including a provision for the project to utilize Kopper's wood wastes, and for a site lease. The steam purchase agreement provides that Koppers will purchase steam requirements of Kopper's Forest Products plant. The price of steam was pegged to the lowest cost fuel available to the Forest Products plant. Koppers must approve the City's plans and specifications for the modular incineration units. The steam purchase contract did not include a guarantee by Koppers to purchase a specific amount of steam, only that it purchase the amount required for current operations. The wood waste agreement is for one year with an annual renewal option. It was felt that woodwaste would serve as an auxiliary fuel source for weekend operations, if operations were expanded, but nothing has happened to date. Koppers will provide wood waste to the City at no cost. The site lease contract covers a 20-year period, where the City is obligated to pay a rental of \$1 per year and all property tax assessments and improvement charges.

4.3.2 Pittsfield, Massachusetts

The Pittsfield plant will be designed, constructed and operated by Vicon Recovery Associates, a subsidiary of Vicon Construction Co. The steam will be sold to a nearby paper company Crane & Co. Project shakedown is expected to begin in November 1980 and last for four to six months.

The financing for the project was provided through tax-exempt pollution control revenue bonds sponsored by a local industrial development authority.* The bonds are guaranteed directly by Vicon Construction and indirectly by Pittsfield's guarantee to deliver waste or pay tipping fees. The initial tipping fee is set at \$11.59 per ton. However, projections indicate profits to the operation which are to be shared 50/50 between Vicon and Pittsfield, thus reducing Pittsfield's upfront tipping fee.

The RFP was prepared by the City engineering and investment consultants. It stated that the City was willing to enter into a put-or-pay contract for delivery of solid waste, to provide a site for the facility as well as a residue and emergency landfill site, and to aid the contractor in obtaining tax-exempt financing. The RFP also identified Crane & Co. as the steam customer. The RFP was advertised in March 1978 and two months later Vicon Recovery Associates was selected.

The steam purchase contract becomes effective in December 1981, or at an earlier date agreed upon by the company and Crane. The project has been set up for a 15 year period. The company must construct the facility and assume all costs relating to steam producing facilities as well as lines and equipment for steam delivery. The company is required to sell and deliver, and Crane to accept and purchase, at least 700,000 lb. of steam per day at a rate of at least 20,000 lb. per hour for 240 Crane work-days. Steam prices will be based on Crane's cost for No. 6 fuel oil discounted by a negotiated rate.

* Robert H. Aldrich, "Small Resource Recovery Project Gets Disposal Revenue Bond Financing", in Solid Waste Management, January 1980.

Pittsfield has shifted the project's technical and performance risk to a private company which guarantees the design and its ability to process waste and generate steam. In return, Pittsfield accepted the responsibility to assure waste stream supply quantity and quality and to pay tipping fees if waste is not available for some reason.

4.3.3 Auburn, Maine

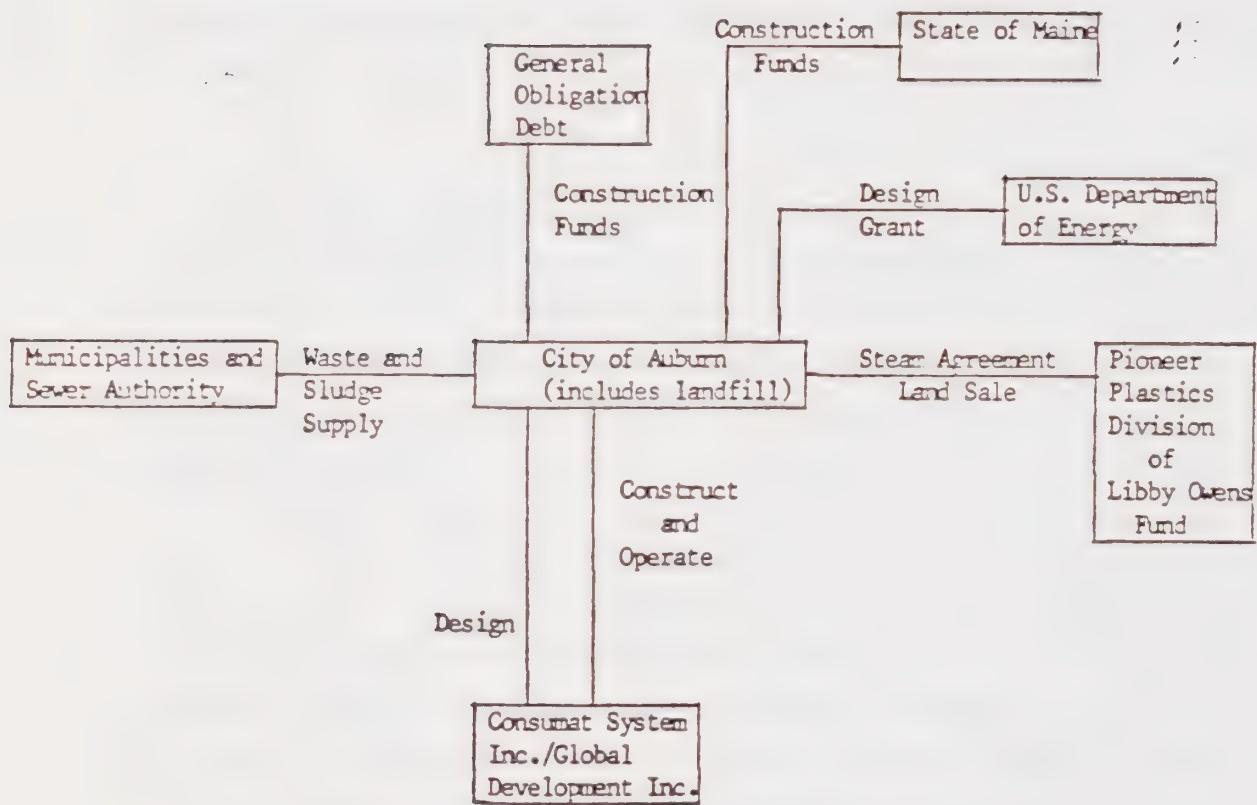
Recognizing a disposal problem in 1974, a planning process was initiated to identify alternatives. In 1975, an energy recovery scenario was identified. Efforts began to crystalize in 1977 when the City prepared an implementation report which highlighted the problem and provided direction. Between 1977 and 1979, the City went through a decision-making process that led to a City-owned, contractor-designed, constructed and operated (over an initial 3 year basis) project. See Appendix C for more detail on the project.

The contract arrangements are depicted in Figure 3. The City decided early on to own the facility and eventually to operate it as well. However, current operating experience in other municipally-owned and operated systems convinced Auburn officials to modify their approach. They decided to give responsibility of design, construction and operation to one contractor. The initial operating phase was set at three years and allows for two five-year extensions.

The City guarantees waste quantity and quality and, in the event of waste-shortfall, an operating fee to the operation. Provisions for processing additional waste and sludge are provided. The City maintains control over additional waste through contractual arrangements with other municipalities and with the sewer authority for sludge supply.

In selecting the contractor, the City solicited a very detailed Request for Proposals describing the project and the contractual terms

FIGURE 3
AUBURN, MAINE CONTRACTS



it was interested in offering. The RFP was released in December 1977, a contractor was selected in July 1978, and contract negotiations with the contractor and steam customer were concluded in October 1979.

The project is backed substantially by the steam sales contract. (See Appendix D.) As Appendix D explains, the revenue generation will be substantial. More importantly, the steam purchaser--a major U.S. corporation--guarantees to "take or pay" for steam. In the event that the steam user closes its facility in Auburn, the agreement also provides for continued payments equivalent to the principal and interest on the City's long-term debt for the project.

The project technology and performance risks are completely shifted to the contractor as long as it remains the operator of the facility. Performance incentive and penalty provisions are included in the operating specifications. The City has the right to take over the facility in the case of non-performance by the contractor over an extended period of time.

The Auburn project is an example of strong desire to both own and operate a resource recovery facility being tempered by recent experience elsewhere and recognition of the fact that the project has to be run as a business--the need to overcome City constraints in personnel and maintenance. It is also worth nothing that the influence and participation of the energy user throughout the planning and contractor selection process was important to the project's success and significantly influenced project structure.

4.4 Specific Levels of Risks

A matrix (presented in Table 4) has been prepared characterizing high, medium, and low levels of risk posture the City of Berkeley could take in dealing with the six major areas of specific risk. These areas are:

- Waste Supply - assuring quantity and quality of input for the the project;

TABLE 4
LEVELS OF RISK FOR BERKELEY PROJECT

RISK AREA	LEVELS OF RISK		
	HIGH	MEDIUM	LOW
WASTE SUPPLY			
- Source Separation	Provide strong support and funding for source separation. Expect to lose between 800-4600 tons per year of solid waste. Do not institute any waste control strategy, including franchising, specifying in license, etc. Do not adjust facility design.	Franchise collection. Provide support for recycling, including ordinances for private efforts. Require waste destined for disposal to be tipped at City facility. Provide low tipping fees.	Adjust facility design for shortfall in tonnage. OR Obtain supply contract to offset expected shortfalls from recycling operations for combustibles.
- Competing Projects	Go forward with City project for large quantity and high tipping fees.	Go forward with project regardless of what outside influence/costs may be in future, i.e. Berkeley alone concept.	Initiate formal discussion with competing projects in efforts to determine the cost, arrangements, and timing for either Berkeley supply or receipt of refuse over a long term basis.
- County of Alameda Approval	Do not obtain written approval/authorization that Berkeley project is part of the County's long range plan.	Obtain staff level recognition that Berkeley project is part of County's long range plan.	Obtain written approval/authorization that Berkeley project is part of the County's long range plan.

TABLE 4 (cont.)
LEVELS OF RISK FOR BERKELEY PROJECT

RISK AREA	LEVEL OF RISK		
	HIGH	MEDIUM	LOW
<u>MARKET</u>	Go forward now with RFP or design without binding negotiations with steam and electricity markets.	Have memorandum of understanding from markets prior to proceeding with design or RFP. Factor terms and conditions into update on economics.	Perform binding negotiations with steam and electricity purchasers which can be assigned to other parties with approval, prior to design or RFP.
<u>DISPOSAL</u>	Be completely dependent upon what might be available in future privately.	Require operator to provide for guarantees on disposal of raw refuse and ash at designated site over the life of the project.	City identify and obtain its own landfill capacity for either raw refuse or ash residue. If possible City acquire landfill to be privately operated for its purposes as part of the project.
<u>FACILITY DESIGN</u>	City designed facility requires design changes due to operations not meeting performance expectations. City pays for design changes and equipment. Downtime in operations most significant economically, which city bears entirely.	Certain problems should arise during startup. Costs for same will be borne by turnkey contractor. Future changes due to performance changes or new regulatory requirements to be borne by city. Performance bonds can be obtained for limited period of time.	Full service operator bears ongoing responsibility for meeting performance requirements related to city solid waste disposal and resource recovery.

TABLE 4 (cont.)
LEVELS OF RISK FOR BERKELEY PROJECT

RISK AREA	LEVELS OF RISK		
	HIGH	MEDIUM	LOW
<u>FACILITY CONSTRUCTION</u>	Facility component procured without one responsible contractor performing to certain cost requirements.	Facility turnkey procured with one contractor responsible for design, construction, and start-up for a fixed price. Future design changes may or may not be the responsibility of the turnkey contractor.	Facility full service procured for design, construction, startup and operation. Future design changes tend to be the responsibility of the contractor. If publicly owned facility, design changes due to negotiated performance changes or new regulatory requirements will be passed through.
<u>FACILITY OPERATION AND MANAGEMENT</u>	City operates with its own staff, trained by city engineers and equipment suppliers.	Turnkey contractor trains city staff. Technical assistance provided on a continued basis.	Full service contractor provides extended operations phase, preferably for life of the project.

- Market - assuring the use of products and the expected levels of revenues;
- Disposal - assuring public health protection aspects of solid waste disposal for the City of Berkeley;
- Facility Construction - assuring the facility is completed per the design, within time and budget;
- Facility Operation and Management - assuring that the facility is operated, maintained, and managed in a manner which provides for the performance requirements which underlie both the solid waste disposal and economic objectives of the project.

The High risk strategy for each of the above-listed areas represents an implementation approach which would provide the greatest opportunity for City exposure in the project. Under the Medium risk posture characterization, a somewhat less exposed position is represented, while in the Low risk characterization, conservative posture is characterized.

If lower risk approaches were followed the City would be led toward a project which had greater opportunity for meeting economic targets, performance expectations, and disposal objectives. If high risk strategies are followed, then there is a greater possibility that these same objectives will not be met.

The relative importance of the risks listed in Table 4 is qualitatively judged as follows:

<u>Importance</u>	<u>Risk Area</u>
● High	Competing Projects Markets Facility Design Facility Construction Facility Operation
● Medium	County Approval Disposal
● Low	Source Separation

Berkeley should take into account these levels of importance when deciding upon the risk strategy to take for any specific risk area. The above also serves to indicate a prioritization of attention and activity toward resole by Berkeley staff and its consultants.

5. RECOMMENDED STRATEGY

Many of the risks identified for this proposed project can be reduced or increased depending upon the procurement approach selected. In view of the stage of development and the lack of certainty in meeting the current economic projections, Gordian recommends that Berkeley proceed with a decision-making process that is incremental. The decision to go forward with a resource recovery project is delayed under this strategy until certain information and events are completed. Without giving the go ahead for resource recovery development now, the City still should move toward making certain decisions in relation to the risk posture it would assume if it later decided to proceed while still providing for disposal of solid waste.

Specifically, it is recommended that the City of Berkeley:

- Obtain up a steam sales agreement with Cal. Ink so that expected revenues and performance requirements are more certain;
- Obtain up an electricity sales agreement with Pacific Gas & Electric so that expected revenues, performance requirements and penalties for non-performance are more clear;
- Proceed with the transfer station portion of the project given other sites and/or energy markets will not be considered;
- Obtain extension of landfill permit at current site to provide for interim disposal over next 3-4 years, i.e. a period over which Berkeley can move into alternative recovery disposal systems;
- Negotiate with competing projects to determine the costs, arrangements, and timing for either Berkeley supply or receipt of solid waste over a long period of time--especially with the County of Alameda;
- Prepare a Request for Proposal for Full Service Resource Recovery Services to be positioned to solicit contractors and determine the real bid cost for the proposed project;
- Prepare a Request for Disposal Services for release simultaneously with the resource recovery procurement in efforts to evaluate alternative disposal options available in the future;
- Implement a waste control strategy such that predictable quantities of refuse will be available for the project or for either transfer to a disposal facility or to another resource recovery project;
- Select a financing method and put in place a structure to undertake financing via the method selected;

- Issue an RFP for a full service contractor and disposal services, evaluate proposals and be positioned to negotiate/sign contract(s);
- Update project economics as part of a proposal evaluation procedure and compare to alternative disposal proposals; and
- Do not proceed with the transfer station part of the project until at least energy markets are confirmed for the current site.

It is recommended that if the City does proceed with resource recovery facility procurement the City proceed to undertake the project through a full service procurement, whereby a private vendor would be sought to design, construct and operate the system according to certain performance guarantees established by the City in its Request for Proposals. The City should also have access immediately if the full service contractor does not perform. The City, in turn, could make at least initial arrangements with the energy user and provide minimum amounts of solid waste for processing and guarantee the operator minimum revenues for having processing capacity available. The City could also seek to provide additional supplies--either through waste control measures or through supply agreements with neighboring municipal governments, including the county. The City would bear the risk of assuring available landfill for emergency requirements, and passing through excess costs to the operator if covered in the performance requirements agreement with the operator. In the same manner, the City would make necessary arrangements for ash disposal and pay for its disposal directly, thereby not affecting the economics of the resource recovery operation.

If competing resource recovery projects or transfer and landfill proposals look more favorable economically and can in fact guarantee an outlet of disposal over a long period of time, the City may elect to enter into a contract with another project. If the resource recovery project economics--as confirmed in the economic analysis following evaluation of proposals, and as a result of firming up the areas mentioned above--prove to be attractive, the City can then proceed toward this solid waste management alternative.

In the near time, the City can proceed with the construction of the transfer station at the currently selected site so that it has the flexibility to either transfer its waste to another project/landfill or provide for emergency haul out if the site does include resource recovery in the future. Early operation of the station should engender lower transportation costs even for disposal over the next several years.

The timeframe in which the above implementation strategy takes place depends greatly on the degree of urgency the City of Berkeley places on developing alternative outlets for solid waste disposal. Certainly, Berkeley must proceed with extending its current landfill capacity. Next, the completion of the transfer station aspect of the project can proceed. Procurement planning for resource recovery, residuals disposal, and emergency landfill back-up should proceed as well in the near future such that the City is in a position to make a long term decision on solid waste disposal within a year. The main determinant, nonetheless, will be the amount of time that the current city landfill will be allowed to operate as a result of the future permit extension application. It is expected that 3 to 4 years additional operating time will be allowed by the Corps of Engineers. If longer, there will be less pressure on the city to proceed, and if shorter, a crisis situation may set in.

It will be important to develop the risk strategy and implementation plan with input from decision makers in the City of Berkeley. Through give-and-take exchanges on the issues analyzed and the recommendations made in this report, municipal officials can develop both an understanding of the venture they are considering and the most appropriate posture to take in developing an alternative long-term solid waste disposal solution through resource recovery.

REFERENCES

1. Chrismon, R.L., Bernheisel, J.F., and Bagelman, P.M., "Trommel Initial Operating Report, Recovery I," TR78-3, National Center for Resource Recovery, Inc., Washington, DC, Oct. 1978.
2. Bagelman, P.M., Bernheisel, J.F., and Parker, W.S., Trommel Performance at Nominal Design Conditions, Test No. 1.01, Recovery I, New Orleans, prepared by NCRR for U.S. Environmental Protection Agency, Cincinnati, OH, 1979.
3. Woodruff, K.L. and Bales, E.P., "Preprocessing of Municipal Solid Waste for Resource Recovery with a Trommel - Update 1977," Proceedings of the 1978 National Waste Processing Conference, American Society of Mechanical Engineers, New York, NY, 1978, pp. 249-257.
4. Trezek, G.J., Obeng, D.M., and Savage, G., Size Reduction in Solid Waste Processing, Second Year Progress Report 1972-1973, prepared by the University of California, Berkeley for U.S. Environmental Protection Agency, Cincinnati, OH.
5. Alter, H., and Crawford, B.E., Materials Recovery Processing Research, A Summary of Investigations, prepared by NCRR for U.S. Environmental Protection Agency, Washington, D.C., Oct. 1976.
6. Private Communication with Ken Dale, Reynolds Metals Co., Richmond, VA.
7. Kenahan, C.B., et al, "Composition and Characteristics of Municipal Incinerator Residues," Bureau of Mines Report of Investigations 7204, U.S. Department of the Interior, Washington, DC, Dec. 1968.
8. Frounfelker, R., Small Modular Incinerator Systems with Heat Recovery, A Technical Environmental and Economic Evaluation, U.S. Environmental Protection Agency, 1979.
9. Private Communication with Tom Barker, Consumat Systems, Inc., Richmond, VA.
10. Handler, I. and Runyon, K., "Performance and Testing of the Ferrous Metals Recovery System at Recovery I," Proceedings of the 1980 National Waste Processing Conference, ASME, NY, NY, pp. 173-188.
11. Private Communication with Bill Wiley, Consumat Systems, Inc., Richmond, VA.
12. Private Communication with Ray Familar, Basic Environmental Engineering, Glen Ellyn, IL.

REFERENCES (Cont.)

13. Kirkpatrick, M.E., "Update on Nashville Thermal," Proceedings of the 1980 National Waste Processing Conference, ASME, New York, NY 1980, pp. 453-462.
14. Rechford, R.S. and Witkowski, S.J., "Considerations in the Design of a Shredded Municipal Refuse Burning and Heat Recovery System," Proceedings of the 1978 National Waste Processing Conference, ASME, New York, NY, 1978, pp. 45-56.
15. Stabenow, G., "Design Criteria to Achieve Industrial Power Plant Reliability in Solid Waste Processing Plants with Energy Recovery," Proceedings of the 1978 National Waste Processing Conference, ASME, New York, NY, 1978, pp. 427-441.
16. Stephenson, J.W. and Eller, V.L., "The Quest for Incinerator Air Pollution Control," Proceedings of the 1980 National Waste Processing Conference, ASME, New York, 1980, pp. 557-579.

APPENDICES

APPENDIX A

ASTM E702-79 Standard Specification for Municipal Ferrous Scrap



Designation: E 702 - 79

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia, Pa. 19103

Reprinted from the Annual Book of ASTM Standards. Copyright ASTM.
If not listed in the current combined index, will appear in the next edition.

Standard Specification for MUNICIPAL FERROUS SCRAP¹

This standard is issued under the fixed designation E 702, the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This specification covers the chemical and physical requirements of municipal ferrous scrap that is intended for use by such industries listed as follows:

- 1.1.1 Copper industry (precipitation process),
- 1.1.2 Iron and steel foundries,
- 1.1.3 Iron and steel production,
- 1.1.4 Delineating industry, and
- 1.1.5 Ferroalloy industry.

1.2 Questions concerning material rejection, downgrading, and retesting based on failure to meet the requirements of this specification shall be dealt with through contractual arrangements between the purchaser and the supplier.

2. Applicable Document

- 2.1 ASTM Standard:
E 701 Testing Municipal Ferrous Scrap²

3. Definitions

3.1 *municipal ferrous scrap*—ferrous waste that is collected from industrial, commercial, or household sources and destined for disposal facilities. Typically, municipal ferrous scrap

consists of a metal or alloy fraction, a combustible fraction, and an inorganic noncombustible fraction that includes metal oxides.

3.2 *total combustibles*—materials that include paints, lacquers, coatings, plastics, etc., associated with the original ferrous product, as well as combustible materials (paper, plastic, textiles, etc.) which become associated with the ferrous product after it is manufactured.

3.3 *metallic yield*—the weight percent of the municipal ferrous scrap that is generally recoverable as metal or alloy.

4. Chemical Requirements

4.1 Municipal ferrous scrap shall conform to the requirements as to chemical composition for the respective end uses prescribed in Table I.

4.2 The chemical requirements listed in Table I are based on melt analyses except where noted.

¹This specification is under the jurisdiction of ASTM Committee E-38 on Resource Recovery and is the direct responsibility of Subcommittee E38.02 on Ferrous Metals. Current edition approved Nov. 5, 1979. Published January 1980.

²Annual Book of ASTM Standards, Part 46.

E 702

5. Physical Requirements

5.1 Municipal ferrous scrap shall conform to the physical properties for the respective end uses prescribed in Table 2.

6. Test Methods

6.1 Determine the physical and chemical requirements of municipal ferrous scrap in accordance with Methods E 701.

TABLE I Chemical Requirements

Element	Copper In- gurity (Precipi- tate Proc- ess) ¹	Composition %			
		Iron and Steel Foundries	Iron and Steel Producers ²	Dense Cast In- gurity ³	Ferroalloy Producers
Phosphorus, max	...	0.03	0.03	...	0.03
Sulfur, max	...	0.04	0.04	...	...
Nickel, max	...	0.12	0.06	...	...
Cadmium, max	...	0.15	0.10	...	0.15
Molybdenum, max	...	0.04	0.025	...	...
Copper, max	...	0.20	0.10	...	0.20
Aluminum, max	...	0.50	0.50	4.00 ⁴	0.15
Tin	...	0.30 max ⁵	0.30 max	0.15 max ⁶	0.30
Lanthanides	...	0.03	0.15	...	...
Zinc, max	...	0.06	0.06	...	...
Iron (metallic), min	96.0	...	...	...	...
Silicon, max	0.10	...	...
Manganese, max	0.35
Carbon, max	0.6
Titanium, max	0.025
Total combustibles, max	0.2 ⁷	4.0	4.0	...	0.5 ⁸
Metallic yield, min	...	90.0	90.0	...	90.0

¹ Experience has shown that material which has been degated probably will not meet these requirements.

² A minimum of 95 weight % of the material delivered shall be magnetic. Nonmagnetic material attached to the original magnetic article may be included in the magnetic requirement.

³ The scrap shall be appropriately processed (for example, by burning, chemical deanning, etc.) to be virtually free of combustibles.

⁴ For steel castings the requirement for tin content is 0.10 max %.

⁵ Not based on melt analyses due to aluminum losses during melting, to be determined by a method mutually agreed upon between the purchaser and supplier.

⁶ Refer to sections on magnetic fraction and chemical analysis of tin in Methods E 701. Normal separation of white goods and heavy iron yields tin contents equal to or greater than 0.15 weight %. Lesser tin contents would impact severely the value of the scrap to dealers.

⁷ The scrap shall be appropriately processed (for example, by burning, chemical deanning, etc.) to be virtually free of combustibles.

TABLE 2 Physical Requirements

End-Use	Bull Den. Btu./lbm. 16/lb' (kg./ m ³)	Property	
			Form
Copper Industry (Precipitation Process etc.)	30 (480)	loose shredded as agreed spot between pur- chaser and supplier; shall not be baled or baled ^a	
Iron and Steel Foundries	50 (800)	loose baled or baled ^b as agreed upon be- tween purchaser and supplier	
Iron and Steel Producers	75 (1200)	loose ^c or baled ^d as agreed upon between purchaser and sup- plier	
Deburring In- dustry	25 (400)	shredded 95 weight % shall be -6. +6 mm (-152. +12.5 mm), shall not be baled, baled, buried uncon- centrated or pyrolyzed	
Ferroalloy Production	50 (800)	loose as agreed upon be- tween purchaser and supplier	

^a Various consumers may establish gage tolerances on
the material they purchase.

^b Industry practice is to specify a maximum bale size that
varies among users.

^c Experience has shown that if the size range is 95 weight
%, -2. +6 in (-50. +15.2 mm) the bulk density requirement
can be met and the material will be loose and free flowing.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years
and if not revised either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional
standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the
responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should
make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a
further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.

APPENDIX B

Small Resource Recovery Project Gets Disposal Revenue Bond Financing

RESOURCE RECOVERY

Small resource recovery project gets disposal revenue bond financing

by Robert H. Aldrich, Senior Vice President, and René Rose, Assistant Vice President, Paine, Webber, Jackson & Curtis, Inc.

Last September, with the issuance by the city of Pittsfield, MA, of its \$6.2 million Solid Waste Disposal Revenue Bonds, 1979 series, for the Vicon Recovery Associates Resource Recovery Project, the first revenue bond financing for a resource recovery facility in about two years was successfully completed. The project being financed is unique in several ways: (1) It represents the first application of revenue bond financing for a small-scale resource recovery facility; (2) the system to be utilized has never been demonstrated on a commercial basis; and (3) the company responsible for the design, construction and operation of the project has never built or operated a resource recovery facility.

The project gains in significance when one considers that in spite of a number of adverse factors—including bad publicity relative to resource recovery in general, a sluggish municipal bond market, and the high leverage characterizing the transaction—only 1½ years elapsed from the time the city issued its solicitation documents to the date the financing was closed. In a day when we are becoming accustomed to lead times for similar tasks on other projects exceeding three years, the Pittsfield-Vicon joint endeavor and accomplishments provide an excellent example for small municipalities with similar disposal problems to follow. However, one should not attempt to correlate this short time with the

relative smallness of the bond issue. As was discovered during this period, from a financing point of view, small-scale resource recovery projects are as difficult to accomplish as large ones.

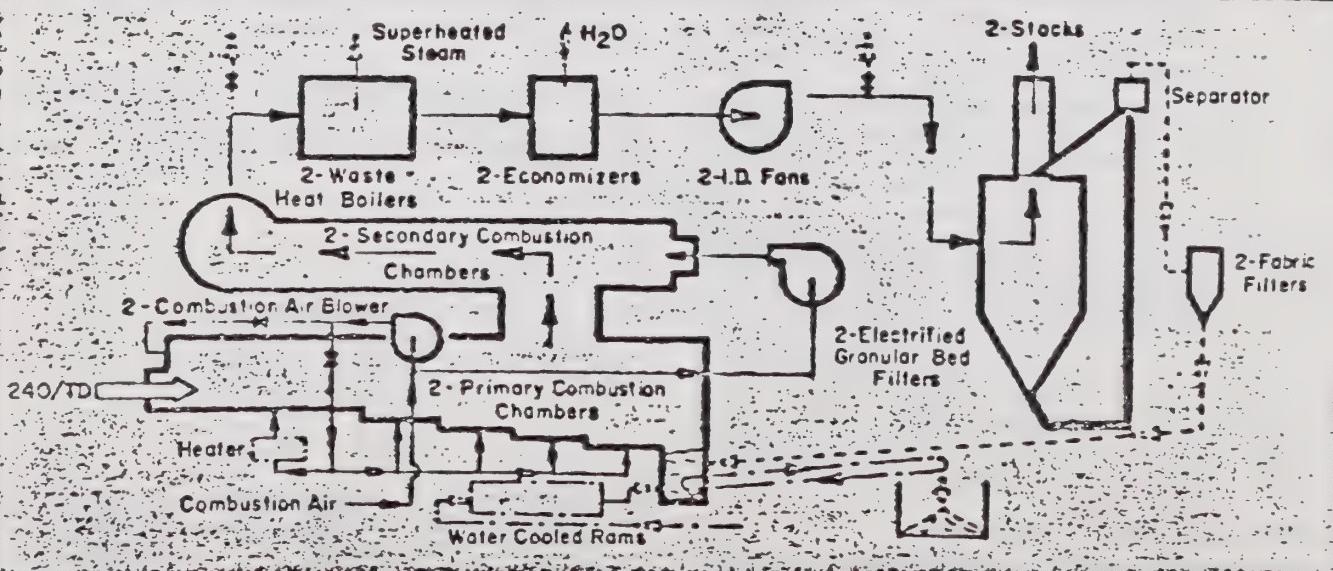
The purpose of this article is to provide a brief description of the project and to detail the key contractual relationships that serve as security features for the financing.

Background

In March, 1978, following the completion of an engineering study which recommended that refuse combustion and steam generation be employed as a solution to Pittsfield's solid waste disposal problem, the city issued a request for proposals (RFP) soliciting proposals from private industry to design, construct and operate a resource recovery facility. The RFP, prepared by Metcalf & Eddy, Inc., the city's engineering consultant, and Paine, Webber, Jackson & Curtis, its investment banker on the project, stated the city's willingness to enter into a put-or-pay contract for delivery of solid waste, to provide a site for the facility as well as a residue and emergency landfill site, and to act as the vehicle for tax-exempt financing of the project. The RFP also identified as a steam customer Crane & Co., Dalton, MA, a manufacturer since 1801 of quality papers, including all established currency for the U.S. government and a number of other countries.

Three firms responded to the solicitation, and following a two-month period of technical and financial evaluation, the city selected Vicon Construction Co., Inc., Lincoln Park, NJ, as a full service contractor with whom to immediately

Figure 1. Engineered waste-to-energy system to be used in Pittsfield plant.



begin contract negotiations. Simultaneous with the city's negotiations, Vicon conducted negotiations with Crane for the sale of steam from the proposed facility. The key features of the resulting service contract and steam purchase agreement, entered into on February 1 of last year, are summarized below.

The system

The project is located on approximately five acres of industrial land near the Pittsfield-Dalton town line. Vicon will utilize a fast-track modular precast concrete building designed and manufactured by its affiliate, Lakewood Precast Co., Inc., of Lakewood, NJ, to house the process equipment and refuse storage pit. The facility includes a cast-in-place concrete refuse storage pit with a 500-ton capacity and a five-ton high-speed bridge crane to transfer the stored waste from the pit to the tipping floor. Diesel-driven front end loaders will transfer the waste from the tipping floor to the incinerator.

Vicon holds an exclusive license to market and manufacture modular controlled-air MSW incinerators designed by Enercon Systems, Inc., of Cleveland, OH. The Enercon incinerator design incorporates a number of its proprietary features which afford economical initial cost, efficient resource recovery (steam) and minimum maintenance.

Three modular controlled-air incinerators will be provided, each rated at 120 tons per day. Normal operation will utilize two incinerators on line with one on standby. Flue gases, upon exiting the primary chambers, will pass through secondary combustion chambers, water tube waste heat boilers, economizers, I.D. fans, and an air pollution control device designed to meet the 0.05 gr./DSCF particulate emission requirements of the Commonwealth of Massachusetts.

The system's features include factory prefabricated modular construction which allows individual modules to be sized up to 240 tpd capacity; a proprietary steam flow control system; the Ener-Grate™ controller air step-type incinerator grate for complete burn down utilizing water-cooled ash transfer rams on multi-level refractory hearths; and advanced design air pollution control equipment to ensure compliance with strict air pollution control regulations.

Enercon Systems, Inc., is a high technology systems engineering company headquartered in Cleveland, OH, specializing in solid waste incineration, energy conservation, resource recovery and air pollution control. In addition to providing systems engineering for this project, Enercon will manufacture the control system and several other components.

The service contract

The solid waste disposal and resource recovery agreement (hereafter called the service contract) between the city and Vicon Recovery Associates (the company, a limited partnership of which Vicon is the general partner) was negotiated on behalf of the city by (1) an appointed solid waste commission which was responsible for the entire project; (2) city counsel; and (3) Ropes & Gray, the city's bond counsel. Paine Webber, through computer-aided financial analyses, provided input to both the city and Vicon relative to the long-term economics associated with changing negotiating postures assumed by both parties. Hawkins, Delafield & Wood, an underwriter's counsel, provided legal assistance to Paine Webber. The service contract, which will have a term of 15 years from the commencement date of the operation, generally provides for the following:

Construction and acceptance

The company is obligated to complete the construction of the facility according to accepted plans and specifications

and in compliance with all regulations (existing or proposed as of February 1, 1979) by September 15, 1980, unless this date is extended due to an act beyond the control of either party. A break-in period of operation will follow completion of construction during which time the city will pay for acceptable waste delivered. The project must meet a preliminary commitment test demonstrating the ability of the system to burn certain quantities of waste within certain time periods. When the test is met, the city's obligation to deliver and pay for waste disposal and the company's obligations to accept and process waste become absolute and the service contract may not be terminated. Final acceptance of the facility by the city will occur when the project demonstrates the ability to (1) incinerate waste at its guaranteed plant capacity of 240 tons per day, (2) generate salable steam, and (3) meet all other specifications. Barring uncontrollable circumstances, the commencement date will be January 16 of next year. The company will suffer liquidated damages if final acceptance does not occur by the commencement date.

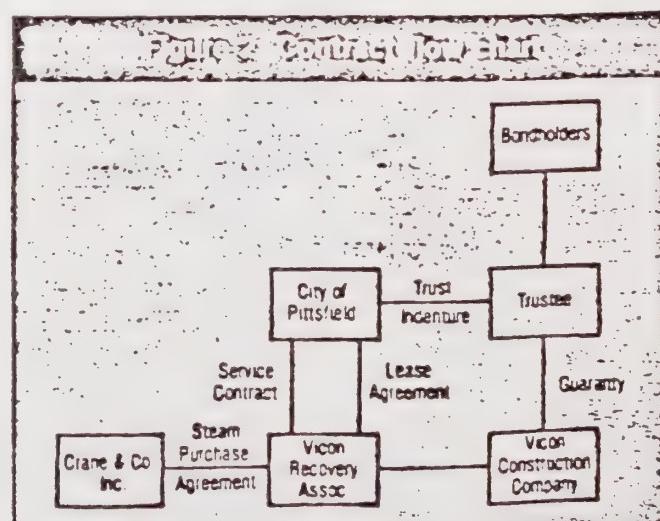
Delivery and disposal

The company must operate and maintain the facility such that it can receive and process acceptable waste in quantities up to 240 tons per day and recover steam for sale to Crane. The city is required to deliver, or have delivered, all acceptable waste generated in the city. The city has guaranteed delivery of no less than 600 tons per week and at least 44,000 tons per year. The city may thereafter increase this quantity by about 50%, but may not decrease it below 44,000 tons per year.

The company may refuse to accept wastes under certain conditions, including amounts that exceed 1,440 tons in any one week. After the first year of operation the company, with the city's approval, may enter into arrangements with private haulers and other municipalities to maximize use of the plant as long as these do not impair the facility's ability to accept the city's waste tonnage quantity then in effect. The city is to provide a prepared landfill to be operated by the company at its own expense. The company will also transport and dispose of all process residues at its expense.

Service payments

Service payments to be made by the city will depend on whether the project is in normal operations or default operations. During normal operations, the city's service fee will be the product of the guaranteed annual tonnage for that year and the applicable base fee per ton. The base fee per ton, exclusive of taxes, is defined as follows: The sum of (1)



\$11.59 and (2) the per-ton value of debt service during that year associated with the financing of changes or additions to the system mandated by government regulations.

The city is to receive a base credit during normal operations equal to one-half of the gross revenues to the project (including the service fee and the steam sales) minus (1) the cost of operating and maintaining the facility and (2) a management fee to the company.

During default operations—as defined by the service contract (see below)—the city is to pay the cost of debt service on the bonds plus the cost of disposing of the waste, less any associated incremental transportation costs incurred by the city in using an alternative landfill.

Default and remedies

The only condition under which the service contract may be terminated so long as the bonds are outstanding is if the preliminary commitment test is not met by December 1, 1982.

The following events would constitute default of the company under the service contract: (1) failure to operate the project according to the service contract; (2) certain events of insolvency or bankruptcy; (3) any default by the company under the lease agreement; (4) failure by Vicon to pay debt service under the guaranty; and (5) failure of the debt service reserve fund to be maintained at its required level for 180 days.

The city would be in default if it (1) failed to fulfill its obligations under the service contract; (2) failed to pay any amounts when due; or (3) committed certain acts of municipal bankruptcy.

Contract expiration

Twelve months prior to the expiration of the service contract, the company will enter into negotiations with the city for a renewal of the service agreement and with Crane for a

renewal of the steam purchase agreement. The company has a right to purchase the project and the land from the city for the price of \$1.00 upon expiration of the lease agreement. Crane has the option to purchase the site and the project at its fair market value if the above negotiations do not result in signed renewal agreements six months before the service contract expires. The city has a right to purchase the project from the company at its fair market value if the company acquires the project but does not renew the service contract and Crane does not exercise its option.

Steam purchase

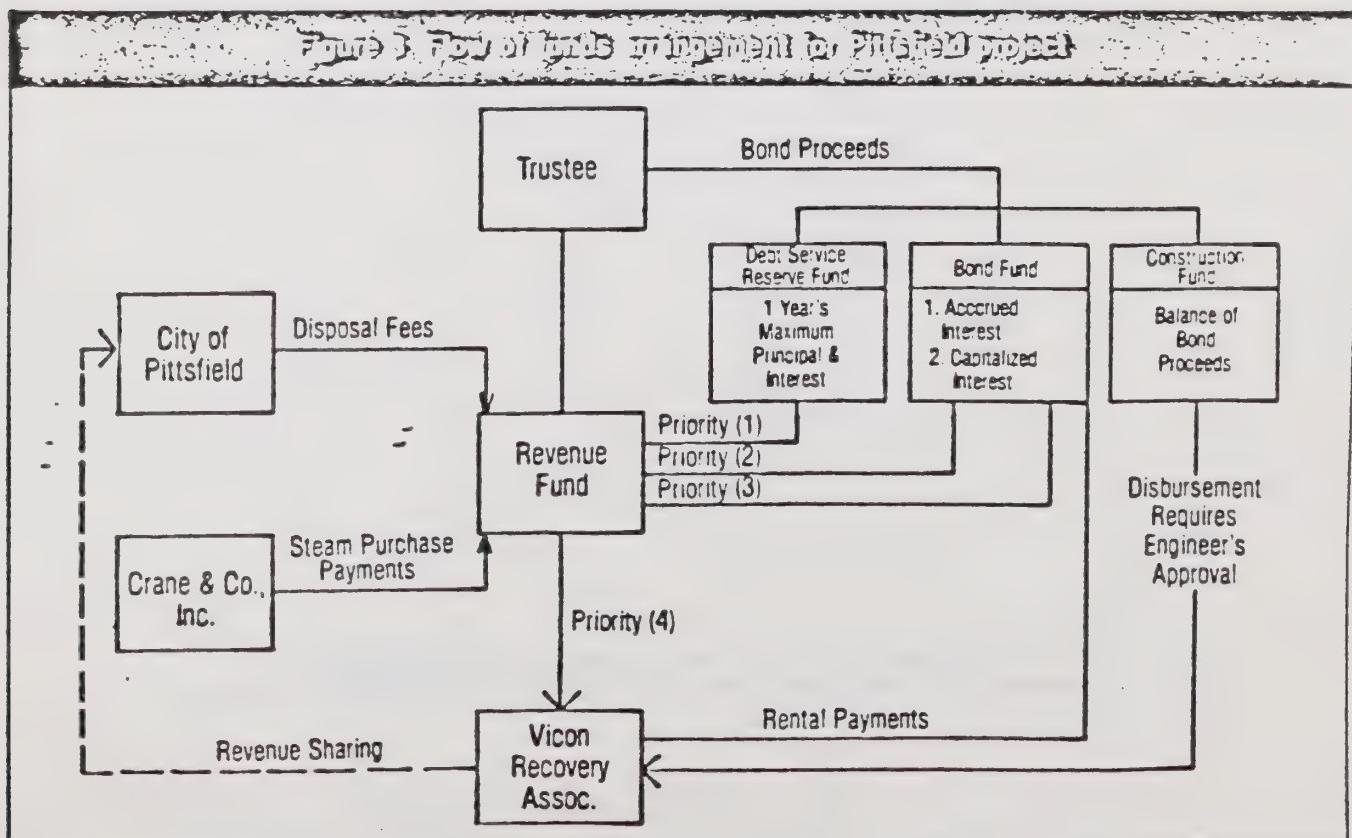
The steam purchase agreement becomes effective on December 1 of next year or at an earlier date agreed upon by the company and Crane. Its term is 15 years. Key provisions of this agreement include:

Construction — The company must construct at its own expense all steam producing facilities as well as lines and appurtenances necessary for steam delivery and must provide steam metering stations. Auxiliary boilers and standby electrical power equipment are to be installed to ensure steam delivery.

Steam delivery — The company is required to sell and deliver, and Crane to accept and purchase, at least 700,000 lb. of steam per day at a rate of at least 20,000 lb. per hour for 240 Crane work days. Greater quantities of steam may also be sold if Crane is able to use them. (The project is expected to provide about 60% of Crane's total steam requirements.)

Payments — The price of the steam will be based on Crane's costs for No. 6 fuel oil discounted by a negotiated rate which will increase from the first year of sales to the 15th year, adjusted according to the boiler efficiency of Crane's existing steam generating equipment. The company will be required to pay monetary damages to Crane for certain losses in production.

Continued on page 93



DEBTEE RECD

Termination — The agreement may be terminated by Crane if the facility is unable to furnish steam by December 1, 1981.

After commencement of the agreement—with notice to the company—Crane may terminate if the company fails to deliver the required steam, breaches the agreement, or goes bankrupt. Also, either Crane or the company may terminate if there is a material change in law or if the company's contract with the city is terminated before steam is being supplied.

The company, upon notice to Crane, may terminate the agreement if Crane fails to pay for steam, breaches the agreement or goes bankrupt. Either party may terminate without liability if either the project or Crane is affected by an event beyond its control.

Financing — The city, acting by and through the city of Pittsfield Industrial Development Financing Authority (IDFA), is authorized under Massachusetts law to (1) acquire solid waste disposal and resource recovery facilities, (2) lease the facilities, (3) issue bonds payable solely from the income and revenues derived from the leasing of the facilities, and (4) secure the bonds by a mortgage on the facilities.

The city will hold legal title to the project so long as the bonds are outstanding. The company, however, is expected to derive the benefits of constructive ownership, including

certain tax credits and deductions. If the bond proceeds are insufficient to complete construction, the company must pay the costs of completion. (The company expects to make an equity contribution to the project of about \$500,000.) The company's obligation to make rental payments equal to debt service on the bonds is absolute and unconditional.

All payments under the service contract and the steam purchase agreement, as well as the company's rental payments, are to be made directly to the trustee. The trust indenture creates four trust funds with the trustee: the bond fund, the debt service reserve fund, the construction fund and the revenue fund. All disposal fees payable by the city to Vicon Recovery Associates, and amounts due from Crane under the steam purchase agreement, are to be deposited in the revenue fund for application to the other funds as specified. Any amounts remaining after the company's payment of approved operating and maintenance costs and taking of a management fee are to be split evenly with the city.

Sharing the risks

At a time when the major commercial banks in the country have raised the prime rate of interest to approximately 15%, the net interest rate of 7.14%—exclusive of the underwriter's discount—that was obtained for this project is indeed attractive. Needless to say, this rate would not have been achieved without strong contracts between the company, the city and Crane; Vicon's commitment to the project; and the city's willingness to share project risks to the extent described above. This project and its financing mark a major milestone in small scale resource recovery history and support the belief that small municipalities may also participate in resource recovery at economically attractive rates for waste disposal. □

APPENDIX C

Resource Recovery and Codisposal in Auburn, Maine

RESOURCE RECOVERY AND CODISPOSAL IN AUBURN, MAINE

LEO R. LAROCHELLE

Public Works Director
Auburn, Maine

and

HARVEY W. GERSHMAN

Gordian Associates Inc.
Washington, D.C.

ABSTRACT

As an outgrowth of efforts to solve their solid waste problems, many small municipalities are investigating a previously unutilized energy resource, solid waste. Revenues derived from a solid waste recovery program can, potentially, reduce overall disposal costs for such communities. A number of interrelated planning activities are required to answer all of the technical, institutional, environmental, and economic questions which arise in any community's consideration of resource recovery. Auburn, Maine is a community with typical waste disposal problems which has been attempting to implement a resource recovery system since 1974. Auburn's needs and methods of seeking solutions illustrate the new and often unique resource recovery questions faced by such municipalities' decision-makers on very unfamiliar ground in making long-term, solid waste management policy decisions. Auburn's method of implementing the concept should be of use to other similar communities. Ground was broken for the construction of a 150 ton/day (136 t/d) starved-air combustion energy recovery facility for the Auburn area in August 1979. The major planning areas identified by Auburn and the experts called upon to assist the community were:

1. Market development.
2. Technology/equipment selection.
3. Landfill development.
4. Regionalization.

All of these planning areas have been regarded as important in Auburn's system planning. None of them could be evaluated or effected without consideration of the others. Unique to this project's implementation has been the manner in which risks were allocated, guarantees obtained, and incentives/penalties provided between the City, its selected contractor (for the design, construction, start-up and commercial operation), and the steam purchaser (Pioneer Plastics, division of LOF Plastics Inc. and Libbey-Owens-Ford Company).

INTRODUCTION

Until the last decade, the only solid waste disposal problem faced by most small communities, including the City of Auburn, was the relocation of the municipal "dump" when residential encroachment or waning capacity indicated that it was time to do so. However, local officials began to find themselves faced with the problem of "finding the new dump" under a new set of constraints stemming from environmental awareness and economic limitations. It was increasingly appreciated that solid waste might be a potential source for either secondary materials which could be reused or energy which could be recovered. About the same time, many communities were constructing sewage treatment facilities to prevent water pollution. Such facilities were often developed with little awareness of the difficulty of dis-

posing of the resulting treatment plant sludges

Auburn is Maine's fourth largest community, with a population of 24,151 people (1970 Census). It is located in south-central Maine on the western shore of the Androscoggin River. Relatively large in area [65.5 sq miles (169.6 km²)], Auburn has historically had a strong industrial heritage. During the first half of this century, the shoe production industry was dominant in Auburn. During the last 25 years the industrial base of the community has shifted and become much more diversified by the establishment of such industries as Pioneer Plastics, General Electric, Tampax, Inc., and Allied Container. Administered by a City Manager-City Council form of government, Auburn maintains a rather healthy fiscal status and has an "A-1" bond rating by Moody's.

In 1974, the Maine Department of Environmental Protection (DEP) adopted regulations which affect the operation of land waste-disposal sites. These regulations require open dumps to be closed or converted to sanitary landfills. Auburn's consideration of its best options, then, obviously required taking steps to conform with these standards. The same general factors influence the disposal of sewage sludge. The timing of the promulgation of the DEP regulations provided an impetus to a regional approach in that all communities in the Auburn area were faced with the roughly simultaneous closing or upgrading of their disposal areas. Accordingly, Auburn and a group of surrounding communities formed a Regional Solid Waste Committee (RSWC) to explore alternatives. Conversations were begun among the communities who had similar solid waste problems to discuss potential common solutions. Charter members of the RSWC included six communities ranging in size from 1000 to 24,000 population.

The goals and objectives of the RSWC were:

1. To identify the best regional approach to solid waste disposal.
2. To determine if the regional approach would be advantageous to each of the member towns of the RSWC.
3. To develop a plan for implementation of the regional approach.

Regular meetings by the RSWC led to the commissioning of a consultant to evaluate the area's solid waste disposal alternatives. The conclusions of this effort were published in May 1975 [1].

The consultant identified two alternatives: a regional landfill in Auburn, and an energy recovery program based on a potential contractual arrange-

ment with an Auburn industry (Pioneer Plastics). In support of its energy recovery conclusion, the report stated that:

"The net disposal cost(s) of the alternatives are comparable. However, steam recovery has considerably more risks, yet also offers several distinct advantages to Auburn. We, therefore, believe that Auburn should make the final choice. Auburn could elect to accept the higher economic risks of steam recovery in order to provide community support for the City's largest industry or to try to reduce Auburn's disposal costs even lower than those predicted for landfill. But if this were the choice, the other communities should not have to be a party to the venture." [2]

At the same time, increased consciousness regarding the general energy situation was developing due to foreign oil pricing policies and the general political upheaval in countries controlling a good portion of the oil imported here. An analysis of New England energy resources indicated that almost 80 percent was provided by petroleum products and that approximately one-third were foreign imports. This highlighted Auburn's awareness of New England's unfavorable position in regard to energy supply and cost and was a major impetus to the community to make a full investigation of energy recovery from solid wastes.

IMPLEMENTATION PLANNING

In March 1977, a report [3] was published to aid Auburn's decision makers in developing an implementation strategy. The report dealt with a specific definition of Auburn's solid waste problem and development of a strategy to achieve an energy recovery or, if necessary, a sanitary landfill facility.

A qualitative analysis of Auburn's waste stream was undertaken. Available truck scales in proximity to the existing Auburn landfill made it possible to monitor the waste stream for three separate one-week periods. The survey revealed that:

1. The average waste quantity being disposed of in Auburn's landfill was approximately 100 tons/day (90 t/d) (commercial, industrial and residential).
2. Over 20 percent of this waste, by weight, originated from Pioneer Plastics' manufacturing of decorative laminates.
3. The Pioneer waste material consisted of two distinct waste categories. Half of Pioneer's waste stream consisted of broken laminates and regular mill waste. The other half consisted of a fine sawdust-textured material which results from cutting

and abrasion processes in manufacturing laminates. Pioneer's waste was determined by laboratory analysis to have an average heat value of approximately 8000 Btu/lb (8400 kJ/kg).

An in-house review committee was formed as an implementation task force. Its composition reflected an appreciation of the complex mix of technical and broad community-interest components of Auburn's eventual decision. This committee included: the City Manager, City Engineer/ Public Works Director, the City Finance Officer, Purchasing Agent and two members of the City Council. The review committee proceeded to evaluate whether the potential advantages of energy recovery would off-set the potential risks as compared to a sanitary landfill option.

The Committee's work began with a familiarization with existing energy recovery systems. It was determined then that insufficient experience existed to easily answer all the questions which any municipality like Auburn would ask in attempting to implement a resource recovery system. At this point in the implementation planning, application was made to the Resource Recovery Division of EPA's Office of Solid Waste Management for assistance. The Mayor's letter to EPA stated that,

"Obviously, with solid waste problems facing us and the ongoing energy crisis, Auburn is very excited about the possibilities of energy recovery in our community. However, our fiscal responsibility requires us to take the least risk with our taxpayer's money. For most of us involved in this consideration in Auburn, this will probably be the first and last resource recovery system we might have to decide on. Accordingly, the expertise available through your technical assistance program will be a major factor in overcoming the hesitancy and time necessary in identifying and dealing with all of the ramifications which might exist." [4]

Acceptance of Auburn's application by EPA provided the City with a valuable resource in dealing with the myriad of questions facing its decision-makers. Auburn felt that this assistance would ensure that mistakes other communities had made in such projects would be avoided. Assistance was focused on the technical and institutional aspects of the system's implementation rather than in a treatise of landfill vs. energy recovery. A strategy options report [5] was prepared to aid the City in making required initial decisions concerning the project's development. This report dealt with the pros and cons of private/public ownership and operation, the risks inherent to these various options, and the methodology for risk-avoidance,

risk-sharing, or risk-assumption. Based on this analysis, Auburn recognized that risk inherent to the project must be properly shared among the City, the contractor, and the energy purchaser. These decisions led to a concept of municipal ownership of a guaranteed system with limited private operation.

The specific planning issues that followed centered around four areas:

1. Energy market.
2. Technology and contractor selection.
3. Residue disposal and landfill back-up.
4. Regional community waste (solid waste and sludge supply agreements).

It was decided also at this point that the City would finance the project with existing fund reserves and general obligation issues. Discussion of the Auburn experience will focus primarily on the energy market and technology and contractor selection.

ENERGY MARKET

No resource recovery project will be viable if sound markets for its products are not developed. The 1975 study of potential users of energy and/or materials recovered from solid waste indicated that Pioneer Plastics was the only viable energy customer within the RSWC area.

Recognizing that Pioneer might be a viable steam customer, the RSWC invited representatives from that company to join in forming the Auburn solid waste review committee to investigate the system's feasibility.

Pioneer expressed interest in participating because:

1. A lower cost might be experienced in the development of the energy (steam) required by Pioneer for both heating and processing.
2. The fuel feedstock (solid waste) for the facility could provide a captive source of energy, while fossil fuels might be curtailed or regulated in the future.
3. The quantity of solid waste from Pioneer (20 percent of the total of Auburn's waste) had to be hauled 10 miles (roundtrip) to Auburn's existing landfill.
4. Pioneer's position as one of Auburn's major taxpayers generates an interest in Auburn municipal matters.

Pioneer's energy needs were analyzed both quantitatively and qualitatively. The steam demand at the plant required superheated steam at 500-600 F

(260-315 C) and a pressure of 285 psig (1961 kPa) maximum respectively. In realizing Pioneer's steam demand, it was determined that an average of 50,000 lb/hr (22,500 kg/h) of steam was needed. Much of this steam was used for processing and would therefore be moderately constant throughout the year.

Negotiations were begun with Pioneer to secure an agreement which would require Pioneer to assume their share of the inherent "risk" of resource recovery. Major points of this agreement included, among others, the consideration that:

1. The purchase price of steam generated within the facility will escalate with escalations in fuel oil costs.
2. Auburn will guarantee to produce a minimum of 15,000 lb of steam per hour (6800 kg/h) at the previously-stated quality.
3. Pioneer will guarantee purchasing 15,000 lb of steam per hour [360,000 lb (163,400 kg)] over a 24 hr period and 93,600,000 lb (4,249,000 kg)/yr for the 20-year duration of the contract.
4. Pioneer will deed five acres ($20,200 \text{ m}^2$) of land for the facility to the City as a part of their commitment to the project.
5. Pioneer will produce the rest of its steam requirements utilizing its existing boiler system. However, the energy recovery facility will provide base-load.
6. Condensate will be returned to the energy recovery facility with a credit given for returned energy.

7. Should Libbey-Owens-Ford close its Auburn plant, LOF will pay all remaining principal and interest on the facility and total facility operating costs for two years after its closing. Principal is calculated at \$170,000 per year and interest at almost \$200,000 during the second year while declining for subsequent contract years.

The City's responsibilities included responsibility to deliver the specified steam minimums stated above, during an operating period to run from 11 p.m. on Sunday through 11 p.m. on Friday, 51 weeks per year, for 20 years. Additionally, the City will accept Pioneer's solid waste material at no cost.

Two alternative steam price formulas were established, the lower of which will be the price to be paid during any given month. The first formula relates the steam price to the value of Pioneer's current fuel oil cost. The second method ties the cost of steam to the Consumer Price Index.

Under the first alternative, the initial commodity

charge ("base price") is calculated as follows:

$$\$12.18/\text{bbl (oil)} \times 6.3 \text{ million Btu (6.65 GJ)/bbl} = \$/\text{million Btu (GJ) (oil)} \quad (1)$$

$$\$/\text{million Btu (oil)} + \text{boiler efficiency} = \$/\text{million Btu (steam)} \quad (2)$$

$$\$/\text{million Btu (steam)} \times 1.235 \text{ million Btu (1.3 GJ)/M lb (steam)} = \$/\text{thousand lb (steam)} \quad (3)$$

where the boiler efficiency is 84.4 percent. The base price will be adjusted if Pioneer's boiler efficiency is proven to have changed. The current monthly charge is then calculated as follows:

$$\begin{aligned} \text{Current monthly charge } (\$/\text{thousand lb steam}) &= \\ \text{base price } \left[1 + .75 \left(\frac{\text{Posted Price - Posted Price}}{\text{Current Month Base Month}} \right) \right] &\quad (4) \\ \$/\text{thousand lb steam} & \end{aligned}$$

where "posted price current month" is Pioneer's plant. The "posted price base month" is set at \$12.18 per barrel. In the event that the "posted price current month" is lower than the base month, the monthly charge is calculated as follows:

5. Posted price current month (for month in which posted price is below posted price base month) $\div 6.3 \text{ million Btu (6.65 GJ)/bbl} = \$/\text{million Btu (oil)}$
6. $\$/\text{million Btu (oil)} + \text{boiler efficiency (percent)} = \$/\text{million Btu (steam)}$
7. $\$/\text{million Btu (steam)} \times 1.235 \text{ million Btu (1.3 GJ)/thousand lb (steam)} = \$/\text{thousand lb (steam)}$.

Under the second alternative, the steam price is set at \$6.36/1000 lb (\$11.45/t) of steam, adjusted (either up or down) for changes in the Bureau of Labor Statistics Consumer Price Index for Urban Wage Earners and Clerical Workers, Northern Region Class D Areas, All Items (1967 = 100.) The base price of \$6.36 is divided by the Index number for the month preceding the month in which the term of the contract commences, and the resulting quotient shall be multiplied by the Index number for the month preceding the month with respect to which the price calculation is being made.

Negotiations between the City of Auburn and Pioneer Plastics were conducted on two levels. It had originally been contemplated by both the City and local Pioneer personnel/management that all negotiating could occur at a local level with final contract ratification by Auburn's City Council and Pioneer's parent company, LOF. However, when the locally negotiated documents were sent to the

parent company, a whole new round of negotiations ensued leading to the document's final approval by both the Auburn City Council and the Board of Directors of LOF.

Additionally, the negotiations dealt with two distinct categories of issues. In the first, the "positive" aspects of the system's functions, steam costs, etc. were dealt with to ensure a common understanding of each party's responsibilities. Considerable time, however, was also spent in dealing with "what if" situations such as terminations, failure to produce steam, etc. The contract [6] was signed in October 1979.

TECHNOLOGY AND CONTRACTOR SELECTION

The selection of technology is obviously a major decision in the implementation of a project. Once Auburn's interest in energy recovery had been publicly stated, numerous unsolicited proposals were received. To ensure that the system procurement would be on Auburn's terms, it was decided that a formal Request for Proposals (RFP) would be developed. The EPA technical assistance staff and consultants (Gordian Associates of Washington, D.C. and Malcolm Pirnie, Inc. of White Plains, New York) were particularly instrumental in the preparation of this RFP.

Recognizing that there could be very broad differences in technologies which could provide the service required, it was decided that the system procurement would utilize a modified turnkey approach. To ensure the selected contractor's intimate involvement in the project, the RFP was written so that the contractor would be required:

1. To provide complete architectural and engineering design in accord with detailed performance parameters.
2. To provide for the purchase of the necessary structures and equipment.
3. To provide all construction services for the approved project design on the City's site adjacent to Pioneer Plastics.
4. To provide all services necessary for plant start-up and trial operation of the facility in its entirety to establish operability of all component systems and equipment.
5. To provide all services necessary for plant acceptance in conformance with the performance requirements and guarantees required.
6. To provide operating, maintenance and output control services for a period of three years from

the initial date of project acceptance.

The RFP contained the following sections:

Section 1. General Information: This section contained information relating to the purpose of the RFP, background information on the project, project goals and overview, project funding, procurement schedule to be followed, and overview of the preparation and submission procedures to be followed in consideration of Proposal.

Section 2. Facility Requirements: This section contained a detailed discussion of the performance requirements of the project's facility. This discussion included a complete discussion of the operating parameters of the facility as well as other requirements applicable during the facility's operations, management and control.

Section 3. Project Scope: This section contained a description of the different phases of the project and the administrative, operating, scheduling, management, and control aspects.

Section 4. Contract Definition: This section contained a discussion of the draft contract (included as an attachment) and the purpose and intent of including a draft contract in this RFP. In addition, discussion of bonding, insurance, payment and audit requirements were presented.

Section 5. Proposal Requirements: This section contained a discussion of instructions for proposers in preparing their proposal packages. This included minimum qualifications which must be demonstrated in the proposal, the actual content of the proposal, proposal format, signing of proposal, proposal guarantee, submission procedures, withdrawal of proposal and modifications to the proposal.

Section 6. Evaluation and Contractor Selection Procedures: This section contained a general discussion of the evaluation and contractor selection procedures including the methodology for evaluation, procedures and schedule to be followed, and negotiations and contract execution procedures and requirements.

Attachments to the RFP included the draft contract, a sample of Pioneer's solid waste with laboratory analysis, and engineering data on the topography and geology of the site.

Recognizing that the available waste streams which could be processed at the facility could range from 100-200 tons/day (90-180 t/d), proposals were requested for two basic system modes. System Mode 1 would have an installed capacity of 100 tons per day (90 t/d); while System Mode 2 would have a capacity of 220 tons/day

(200 t/d). Potential contractors were required to provide a proposal for each mode. Optional proposals were requested on ferrous metal recovery and sewage sludge disposal.

Contractors who submitted proposals were required to provide system guarantees for: 1. steam quantity and quality; 2. air emissions; 3. solid waste volume reduction; and 4. supplementary fuel consumption.

The RFP was issued on December 1, 1977; on February 28, 1978 proposals were received and six were accepted for evaluation. These proposals were submitted by:

1. Consumat Systems, Inc.
2. Eco Resources Limited
3. Envirotech Corporation
4. Lehigh Forming Co., Inc.
5. Vicon Construction Company
Paulis & Sokolowski Inc.
6. Scientific Energy & Recycling Group, Inc.
6. Waste Management Inc.

These proposals represented a variety of different technologies with capital cost for a Mode 1 system ranging from two million to over six million dollars.

For proposal evaluation, Auburn's solid waste review committee, along with a group of advisors (including EPA's technical assistance staff and consultants) were subdivided into two work teams. One team, headed by the City's Finance Officer, analyzed the economic and financial aspects of the proposals, while the other team, headed by the Public Works Director/City Engineer, dealt with the environmental, technical, and management aspects of the proposals.

It had been stated in the RFP that the proposals would be evaluated on the following weighted criteria:

1. Technical Reliability of Proposed System Design (Weight 30 percent).
2. Management Qualifications (Weight 10 percent).
3. Financial qualifications (weight 20 percent).
4. Economics (weight 30 percent).
5. Environmental impact and aesthetics (weight 10 percent).

Initial evaluations were performed to determine which of the proposals were responsive to the RFP requirements. Of those submitted, three were determined to be responsive. These included the proposals received from: Consumat Systems, Inc., Waste Management Inc., and Envirotech Corp.

The general closeness of the evaluation results

between Consumat Systems, Inc. and Waste Management Inc. led to the conclusion that, although the Consumat proposal was determined to be the best proposal submitted, the City could still be served well in negotiating a contract with Waste Management Inc. should negotiations with Consumat Systems fail.

In order to maintain project momentum at the conclusion of EPA's technical assistance, Gordian Associates continued their involvement under contract to the City. Their involvement included:
1. the development of a project cost model to evaluate the effect of various factors on system costs through the expected life of the facility;
2. assistance in the development of a contract with the energy user; 3. a review of the design and capital cost aspects of the system by an engineering consultant subcontractor (Camp, Dresser & McKee, Inc.).

The codisposal of solid waste and sewage sludge had been viewed as a potential alternative to siting a landfill for sludge disposal. Auburn and Lewiston jointly operate a secondary treatment sewage plant on the bank of the Androscoggin River, which generates 75,000 wet tons [68,000 t (20 percent solids)] of sludge per year. With this interest, application was made in August 1978 to the Department of Energy for funds to provide design of the basic solid waste facility and to perform a feasibility study of the potential of codisposal of municipal solid wastes and perhaps sludge in controlled air incinerators. Auburn was awarded a grant in October 1978, and as a result, a contract was signed with Consumat to perform those tests which could determine the feasibility of codisposal. A further award of a contract to the engineering subcontractor was also made to provide an overview of Consumat System's efforts and of the handling problems associated with sewage sludge.

It was decided during the first part of the feasibility study that the major factors that had to be explored concerning the potential of codisposal included the following:

1. The ability of the modular controlled air incinerators to completely combust the sewage sludge without discharge of sludge associated organisms.
2. The relative tradeoffs required in combusting typical Auburn and Lewiston sludge (20 percent solids) had to be quantified. Energy utilized to combust the sludge could not be utilized to produce steam for the primary customer.
3. The alternatives in handling the sludge

(dewatering, etc.), also had to be evaluated to determine the most cost-effective manner of handling.

4. An assessment of environmental impacts needed to be made to determine any requirements for additional system components (air emissions control etc.).

Full-scale testing on most of the above question areas has been undertaken in the North Little Rock, Arkansas facility equipped with Consumat units. Initial tests have led to some optimism that codisposal might be feasible. As of October 1979, however, final tests had not been run to settle the question of feasibility.

PERFORMANCE GUARANTEES

The Contractor (Consumat) has warranted that the process and equipment parameters provided can be consistently met during normal operations, provided the equipment is operated in accordance with the manufacturer's instructions. Specifically, the following process and equipment operating parameters are warranted and guaranteed:

AIR EMISSIONS

When operated in accordance with the manufacturer's instructions, the equipment will meet or surpass the State of Maine and federal D.E.P. air emissions standards in effect on the date of contract execution.

AUXILIARY FUEL CONSUMPTION

When operated at or near design capacity, in accordance with manufacturer's instructions, the equipment will not consume more than 500,000 Btu's of auxiliary fuel per ton (580 kJ/kg) of typical municipal solid waste processed.

PROCESS CAPABILITY

When operated on a continuous basis (24 hr/day), in accordance with the manufacturer's instructions, each incineration module will process 4200 lb/hr (1906 kg/h) of typical municipal solid waste during a 24-hr period.

ENERGY CONVERSION

When operated in accordance with manufacturer's instructions at or near design conditions

and supplied with feed water consisting of a mixture of 50 percent condensate return and 50 percent raw water, each module will produce 4800 lb (2180 kg) of steam when supplied with gas generated through processing of one ton of typical Auburn-Pioneer Plastics Solid Waste. The condensate return temperature shall be at least 200 F (93 C) and the raw water temperature shall be at least 54 F (12 C). If either waste quality or feed water temperature are other than described above, then performance requirements will be adjusted through calculations to reflect these changes.

ASH RESIDUE

When operated in accordance with the manufacturer's instruction, the combustible residue remaining after processing shall not exceed five percent weight of the total combustible tonnage processed.

The preparation of the protocol for the tests required to determine compliance with these process and equipment operating performance the guarantees will be developed in future negotiations between the Contractor and the City prior to performance testing. [8]

CONTRACTOR COSTS

The capital costs for construction of the facility in accordance with the contract documents is \$3,281,250.00.

The cost for commercial operation of the facility in accordance with the contract documents in the base year is \$429,555.00. Further adjustments can be made for additional waste and energy production as follows:

NET PROCESSING FEE

Contractor shall be paid \$429,555 net processing fee each year for processing an annual base of 26,000 tons (23,400 t) of feedstock, in accordance with the terms and conditions of the contract. For each ton in excess of the annual base tonnage processed, the Contractor shall be paid \$8.04/ton (\$8.86/t) additional net processing fee. For each ton less than the annual base tonnage, which the Contractor cannot process but which the City is able to deliver, the City shall deduct \$16.52/ton (\$18.21/t) from the net processing fee paid to the Contractor. Notwithstanding the above, no adjustments shall be made in the net processing fee paid

to the Contractor if the actual annual tonnage processed is within five percent of the annual base tonnage previously stated.

ADDITIONAL ENERGY FEE FORMULA

Recognizing that the City receives substantial benefit for the effective and efficient operation of the plant by the contractor in the form of additional steam revenues and, further, that it behoves the City to provide an incentive to the Contractor to maximize the energy output of the system, therefore, the City agrees to pay to the contractor, as additional compensation, a percentage of the steam revenues generated that exceeds the system guarantee, based on the following formula:

$$\begin{aligned} & \text{Actual tons of feedstock processed} \times \\ & 4800 \text{ lb steam per ton processed} \times \\ & \text{steam price per pound} = \text{Base Steam} \\ & \text{Revenue} \end{aligned}$$

The Contractor shall be paid 25 percent of the difference between the actual steam revenues received and the base steam revenues projected as additional energy fees.

The Operating Cost Adjustment to which the Net Processing Fee shall be in effect and applicable for each ensuing fiscal year of the Facility's Commercial Operation after the first fiscal year of Commercial Operation, including any extension or renewal periods agreed to. The Operating cost Adjustment shall be computed annually during the two months next following the close of the applicable fiscal year. The adjustment shall be equal to One Hundred Percent of the percentage change in the Consumer Price Index - All Urban Consumers (CPI-U) published by the Bureau of Labor Statistics, U.S. Department of Labor, for the Greater Boston Area, or a comparable, successor Index reasonably agreed upon by the parties. The Operating Cost Adjustment shall be added to, or subtracted from, the Net Processing Fee, according to the following formula:

$$\frac{\text{CPI-U or 12th month}}{\text{of applicable fiscal year of commercial operations just concluded}} - \frac{\text{CPI-U for 1st month of commercial operations}}{\text{Net Processing Fee}} = \frac{\text{New Charge to City}}{}$$

Because the new charge to the City will not have been computed by the billing dates applicable to the first two months of the new fiscal year, the entire amounts of the increase occasioned under the Operating Cost Adjustment set forth above for those first two months may be added to the first billing to the City after this adjustment becomes known.

Should the Bureau of Labor Statistics not publish a CPI-U index relating to either the first month of the Commercial Operating Period or the twelfth month of any applicable fiscal year of Commercial Operations, the parties agree that they will average the closest month for which a CPI-U is published on either side of the reference month, according to accepted mathematical principles [9].

LANDFILL DEVELOPMENT

Auburn recognized early that no matter what solid waste management system was implemented, a landfill would still be necessary. During the initial planning phases of the project, it was decided that landfill development would be required 1. to provide the carry-over capacity needed for use during final planning and implementation of the resource recovery system; 2. to provide a disposal facility for the resource recovery system and residue materials; and 3. to provide a system bypass facility.

One of the reasons for Auburn's consideration of a resource recovery system was the depletion of capacity in its existing landfill facility. An assessment of remaining capacity during initial planning indicated that there was insufficient capacity to serve the City during the time necessary to implement the resource recovery system. It was decided to design an interim landfill in proximity to the existing facility. This site was designed to serve the City for approximately two years and was approved by all local and State agencies for this period.

Simultaneous with the effort to develop an interim landfill, it was decided to also seek approval on an ash residue landfill. One of the sites originally evaluated was felt to have potential for this use. Within five miles of the proposed processing facility, the site had been rejected as a potential regional landfill because of its limited capacity. However, the volume and weight reduction anticipated from the resource recovery system allowed the site to be considered for a bypass/ash disposal facility. A long-term lease was nego-

tiated with the Maine Turnpike Authority (MTA), the existing land owner, for this use.

The plans for both facilities were submitted to local boards and the Maine Department of Environmental Protection and approval was received for both facilities. The City has been utilizing the interim landfill since approval. Developmental work has begun for the ash landfill.

In securing early approval of the residue disposal facility, it was also considered that, should the resource recovery system not be implemented, the MTA site, already approved, could have been used as a three year capacity, unprocessed sanitary landfill allowing time for implementation of a more long-term solid waste management system.

REGIONAL PARTICIPATION

Initial consideration of resource recovery in the Auburn area was through the Regional Solid Waste Committee (RSWC). The various members of the RSWC had been waiting for Auburn to develop the implementation of the system.

The proposals received indicated that a definite economy of scale exists in the technologies evaluated. The modular nature of the selected technology easily allows for different capacities based on the number of incinerators installed. Auburn has been concerned that installed incinerator capacity should be sufficient to handle only the waste actually committed to the project. Therefore, the conversations with the regional communities have been aimed at securing the waste which brings about the realization of the economy of scale. Flexibility is to be provided in the system design which will allow for future addition of an incinerator/energy module. Each regional community has had to weigh the cost and advisability of both disposal and transportation of its waste in comparison with its own local alternatives. Fifteen communities have thus far committed to the project representing an additional 70 tons/day (60 t/d) of solid waste.

COMMENTS

Resource Recovery would appear to be feasible for many small communities if certain factors exist. These factors must be evaluated to determine individual characteristics found in each community. At the very least, the planning areas mentioned in this report should be considered and the following issues addressed:

1. A market must exist for the recovered resource.
2. The technology selected to achieve a desired result must be capable of performing in an adequate economic and environmental manner.
3. A landfill (ash residue, etc.) is an integral part of most resource recovery systems.
4. Regionalization might be warranted by an economy of scale which appears to exist in many resource recovery technologies.

There are several other aspects of Auburn's experience which can provide valuable information for communities considering similar projects.

To obtain funding and expertise at relatively little cost to the community, Auburn made very good use of available federal programs. The DOE grant and judicious use of EPA's Technical Assistance Consultants were key factors in the implementation process.

Auburn also realized early in the process that appropriate consultant advice was important to making knowledgeable and cost-effective decisions. A corollary to this realization was that one consulting firm usually does not have the comprehensive expertise required to handle all of the disparate elements incorporated in such a project. Consequently, Auburn employed several different consultants, each specifically qualified to resolve a particular problem.

One of the most valuable lessons that can be gained from Auburn's experience is derived from the attention paid to the energy market. Pioneer Plastics, in developing the plans. By including Pioneer in the decision-making process, Auburn was able to develop a contract which clearly defined and allocated the respective risks and responsibilities involved in the project. Similarly, the contract with the system vendor incorporated strict performance requirements (backed by penalties for non-compliance) and included the risk transference arrangements insisted upon by Auburn.

Auburn is now able to proceed full speed ahead with its project, confident that the risks inherent to the resource recovery system are wholly identified and managed in a way that is acceptable to the community.

REFERENCES

- [1] Opportunities for Regional Solid Waste Management," Arthur D. Little, Inc., Cambridge, Massachusetts, May 1975
- [2] Ibid., p. 1-11.

- [3] "Solid Waste Management Implementation Report," City of Auburn, Maine, Department of Public Works, March 1977.
- [4] Correspondence to U.S. Environmental Protection Agency from Mayor Jack O. Smith requesting assistance, Feb. 17, 1977.
- [5] "Strategy Options for the City of Auburn, Maine, Energy Recovery Project," Development Sciences Inc., June 1977.

[6] "Steam Purchase Agreement," between the City of Auburn, Maine and Pioneer Division of LOF Plastics, Inc., signed Oct. 1979.

[7] "Evaluation Report," City of Auburn, Maine, Department of Public Works, July 1978.

[8] Auburn Solid Waste Energy Recovery Contract, between the City of Auburn, Maine and Consumer Systems, Inc., signed Oct. 1979.

[9] *Ibid.*

gci

Key Words

Facility
Incinerator
Municipality
Planning
Refuse
Sewage
System

APPENDIX D

Auburn Steam Contract

STEAM PURCHASE AGREEMENT

Agreement made as of October 4, 1979, between the City of Auburn, Maine ("City") and Pioneer Division of LOF Plastics Inc., a New Jersey corporation having a manufacturing facility located in Auburn, Maine ("Pioneer").

RECITALS

The City is in the process of purchasing a waste disposal system capable of disposing by incineration typical municipal waste (residential, commercial and industrial).

In addition to such incinerator disposal system, the City is in the process of purchasing a separate "energy recovery system" which will be capable of supplying certain steam energy requirements for Pioneer's manufacturing facilities located in Auburn, Maine. The City will produce and sell to Pioneer and Pioneer will purchase from the City, all steam produced by the refuse-steam plant up to Pioneer's steam requirements at its existing and future manufacturing facilities located at Pionite Road, Auburn, Maine.

In consideration of the mutual covenants and conditions contained in this Agreement, and intending to be legally bound, Pioneer and the City agree as follows:

Section 1. Definitions. As used in this Agreement:

1.1 Steam. The word "steam" shall mean steam energy meeting the quality requirements specified in Paragraph 3.2 of this Agreement.

1.2 Pound of Steam. The words "pound of steam" shall mean the weight of steam which occupies 1.737 cubic feet at a temperature of 476°F and at a pressure base of 280 psig superheated.

1.3 Psig. The term "psig" shall mean pounds per square inch gage.

1.4 Combustible Waste. The words "combustible waste" shall mean burnable solids which have no economic value to Pioneer other than burning (including wood scraps, laminate scraps and sawdust) and, in the event that the City's refuse-steam plant disposal system has the ability to burn liquids, shall also mean all burnable liquids which have no economic value to Pioneer other than burning.

1.5 Refuse-Steam Plant. The words "refuse-steam plant" shall mean the facilities to be constructed and operated by the City pursuant to Section 2 of this Agreement.

1.6 Point of Connection. The words "point of connection" shall mean a single interface between the City's steam piping and condensate return system and Pioneer's steam piping and condensate return system, which interface shall be located at a point on Pioneer's property line nearest the energy conversion equipment.

1.7 Boiler Efficiency. The words "boiler efficiency" shall mean the percentage of gross Btu input that is realized as useful Btu output; $E = \text{Btu output/Btu input.}$

1.8 Barrel Fuel Oil. The words "barrel oil" or its symbolic equivalent (bbl) shall mean a liquid volume measurement equivalent to 42 U.S. gallons.

Section 2. Construction Site and System

2.1 Location of Plant. The City will locate the refuse-steam plant on a five acre site adjacent to the existing Pioneer manufacturing facilities in Auburn, Maine as indicated on the plan attached to this Agreement as Exhibit A, and as more particularly bounded and described on Exhibit B to this Agreement (the "site"). Pioneer will sell the site to the City and City will

purchase such site from Pioneer in accordance with the terms set forth in this Paragraph 2.1.

The site shall be conveyed for the consideration set forth below by Quit Claim Deed with Covenant to the City and such deed shall convey all right, title and interest of Pioneer in and to the site except as may be noted in the description set forth at Exhibit B, and subject to (a) an easement reserved to Pioneer over the entire site for the purpose of building, rebuilding, repairing, altering, adding to or maintaining at Pioneer's own expense and so as not to interfere with the operation of the refuse-steam plant by the City, pipes, pipelines, sewer lines, wires or any other utility conduits, which cross or may cross the site, either underground, on the surface or above ground; and (b) a right of entry for condition broken if the City fails or ceases to operate the refuse-steam plant to be constructed on the site for the production of steam as provided in Paragraph 7.1 of this Agreement.

The site shall be conveyed by Pioneer to the City for the sum of One Dollar (\$1.00) and other valuable consideration to be paid at the time of closing. Closing of the transaction shall occur on October 4, 1979, at the Pioneer Plant, Pionite Road, Auburn, Maine (or any other time, date, and place as may be mutually agreed upon by the parties).

Full possession of the site shall be delivered by Pioneer to the City on the date of closing, said site to be in the same condition as it now is, reasonable use and wear excepted.

The parties agree that real estate taxes shall be prorated as of the date of closing.

The acceptance of a deed by the City, and the payment of the purchase price pursuant to the terms and conditions set forth above, shall be deemed to be a full performance and mutual discharge by and between the parties of every covenant and agreement contained or expressed in this

Paragraph 2.1.

2.2 Contingent Event. This Agreement is made contingent upon closing of the transfer to the City by Pioneer of the land site described in Exhibit B in accordance with the provisions of Paragraph 2.1. In the event that transfer of the site is not closed in accordance with the provisions of Paragraph 2.1, this Agreement shall be void.

2.3 Construction of Plant.

A. The City agrees at its sole cost and expense to purchase, construct, install, operate and maintain or to provide necessary funds required for the construction, installation, operation and maintenance of improvements (including buildings, waste disposal equipment, energy conversion equipment and associated facilities) necessary to produce steam through incineration of combustible waste, and to deliver such steam to the point of connection. The City will not commence such construction until after the closing of the sale of the site by Pioneer to the City as provided for in Paragraph 2.1 of this Agreement. The City further agrees to construct or have constructed the refuse-steam plant in accordance with all applicable local, state and federal laws and regulations. The plans and specifications for the refuse-steam plant have been approved by the City and are on file in the Office of the City Clerk.

B. Pioneer will receive and transport steam from the point of connection into its Auburn, Maine manufacturing facility for use by Pioneer. Pioneer will furnish, at no cost to the City, a steam line and condensate line properly supported and insulated as required for transportation of steam and condensate from the point of connection to Pioneer's manufacturing facilities and return. Ownership of the Pioneer-furnished steam and condensate lines shall remain with Pioneer even after termination of this Agreement and regardless whether such lines are connected to the City's facilities.

C. The City may enter into contracts or subcontracts with third parties for the construction and operation of the refuse-steam plant. In such event, Pioneer will continue to look to the City for performance of the City's obligations pursuant to this Agreement, and the City will guarantee performance of this Agreement by such contractors or subcontractors.

2.4 Measurement of Steam and Condensate.

A. The City agrees to provide and maintain at its expense a recording steam flow meter which makes a continuous record of steam pressure and temperature. In addition, the City will provide and maintain at its expense a recording condensate flow meter which makes a continuous record of the volume of return water and temperature.

B. Pioneer may install, maintain and operate at its own expense such check measuring equipment as it shall desire, provided that such equipment shall be so installed so as not to interfere with the City's measuring equipment. The accuracy of Pioneer's check measuring equipment shall be verified by Pioneer at reasonable intervals and, if so requested, in the presence of representatives of the City.

C. The accuracy of the City's measuring equipment shall be verified by the City at reasonable intervals, and if so requested, in the presence of representatives of Pioneer, but the City shall not be required to verify the accuracy of such equipment more frequently than once in any thirty (30) day period. Pioneer may at any time notify the City that Pioneer desires that the City undertake a special test of any measuring equipment. The expense of any such special test, if requested, shall be borne by Pioneer if the measuring equipment tested is found to be in error by not more than two percent (2%), either fast or slow. Following such test, previous recordings of such equipment shall be considered accurate in computing deliveries of steam; but such equipment shall be adjusted at once to record accurately. If

upon test, any measuring equipment shall be found to be inaccurate by an amount exceeding two percent (2%), either fast or slow, then the expense of such test shall be borne by the City and any previous recordings of such equipment shall be corrected to a zero error for any period which is known definitely; but in case the period is not known or agreed upon, such correction shall be for a period extending over one-half of the time elapsed since the date of last test.

D. In the event a meter is out of service or is known to be registering inaccurately, the volume of steam delivered shall be determined as follows:

- (1) by using the registration of any check meter or meters, if installed and accurately registering, or in the absence of such check meters,
- (2) by correcting the error if the percentage of error is ascertainable by calibration, tests or mathematical calculation, or, if both Subparagraphs (1) and (2) are inapplicable, then,
- (3) by estimating on the basis of deliveries during periods under similar conditions when the meter was registering accurately.

If the meters are located on Pioneer's property, Pioneer will provide access to the City at any time. Pioneer may inspect the steam meter charts and condensate meter charts at any time upon reasonable notice to the City, and will be entitled to have its representative present and observe the steam and/or condensate meter each month at the time the flows are read for billing purposes.

2.5 Due Diligence in Construction of the Plant. The City will complete the purchase, construction, and installation of the refuse-steam

plant and place the same in operation with due diligence.

Section 3. Terms of General Agreement, Purchase and Sale

3.1 Terms of Agreement.

A. Pioneer's combustible waste constitutes an important source of fuel for the City's refuse-steam plant. Therefore, to assure that the quantities of steam required by this Agreement shall be produced by the City, Pioneer agrees to provide all its combustible waste to the City's refuse-steam plant without charge to the City. Pioneer further agrees to purchase from the City all steam generated by the City at its refuse-steam plant up to Pioneer's maximum steam requirements at its Auburn, Maine, manufacturing facilities. The steam so generated by the City and delivered to the point of connection will be for the use of Pioneer or its affiliates, and, so long as Pioneer remains in business at its Auburn, Maine facility, may not be resold by Pioneer without the express prior written consent of the City.

B. Subject to the provisions of Section 7, the term of this Agreement shall be twenty (20) years, commencing on the date of the City's first delivery of steam to Pioneer.

3.2 Quantity and Quality of Steam. The City will make available to Pioneer at the point of connection in accordance with the operating schedule set forth in Paragraph 5.1 at least 15,000 pounds per hour average of superheated steam with 60°F superheat minimum at 280 psig minimum, and 100°F superheat maximum at 285 psig maximum. Delivery shall be, as a minimum, a total of 360,000 pounds of steam within each 24-hour period.

3.3 Pioneer Boilers to Supplement City Steam. Pioneer will have the right to maintain, replace, enlarge and continuously operate at its plant its own boiler system to produce that portion of Pioneer's steam requirements which the City does not produce through the refuse-steam plant, and Pioneer

shall have no obligation to pay the City for the use of such Pioneer-produced steam.

3.4 Pioneer Option. In the event that the City acquires the capacity to generate electric power utilizing steam generated from the refuse-steam plant in excess of Pioneer's requirements for steam, the City will negotiate with Pioneer for the purchase of such electric power by Pioneer before negotiating with any other party for the purchase of such electric power. In the event that the City and Pioneer are unable to reach agreement respecting the purchase of such electric power by Pioneer, the City will notify Pioneer in writing of the price for such electric power negotiated by the City with a third party and Pioneer will have a right of first refusal, exercisable by written notice given to the City within five (5) business days after receipt of the City's notice, to purchase such electric power at the price set forth in the City's notice.

Section 4. Payment Rates and Terms

4.1 Steam Service Basis. Steam will be sold by the City to Pioneer on the basis of a commodity charge only for each thousand pounds ("M lb") of steam delivered to Pioneer. The price to be paid for such steam by Pioneer to the City will be the lower of the price computed pursuant to Subparagraph 4.2A or the price computed pursuant to Subparagraph 4.2B. In either case, a credit will be given to Pioneer for returned condensate in accordance with the provisions of Paragraph 4.3, and the City will give Pioneer a volume discount pursuant to the provisions of Paragraph 4.4. There will be no adjustment in the steam billing rate for normal variations in the pressure and temperature of the steam as defined in Paragraph 3.2 of this Agreement. Quantities of steam and condensate will be measured as provided in Paragraph 2.4.

4.2 Computation of Steam Rates. The price to be paid by Pioneer to the City for steam pursuant to this Agreement shall be the lower of either the

price computed pursuant to Subparagraph 4.2A or the price computed pursuant to Subparagraph 4.2B.

A. Under this alternative, the initial commodity charge ("base price") to be paid by Pioneer for steam furnished by the City pursuant to this Agreement shall be calculated as follows:

- (1) \$12.18/bbl (oil) ÷ 6.3 million Btu/bbl = \$/million Btu (oil)
- (2) \$/million Btu (oil) ÷ boiler efficiency = \$/million Btu (steam)
- (3) \$/million Btu (steam) × 1.235 million Btu/M lb (steam) = \$/M lb (steam)

where the boiler efficiency is 84.4%. If, however, during the term of this Agreement, Pioneer achieves a steam boiler efficiency value (certified by an independent engineer acceptable to both parties using the Power Test Code [Short Form] Stationary Steam-Generating Unit, published by the American Society of Mechanical Engineers) different from 84.4%, the base price shall be recalculated pursuant to expressions 1 through 3 for purposes of thereafter determining the current monthly charge under expression 4. The current monthly charge to be paid by Pioneer shall be calculated as follows:

$$(4) \text{ Current monthly charge } (\$/\text{M lb steam}) = \\ \text{base price } \$/\text{M lb. steam} \left[1 + .75 \left(\frac{\text{Posted Price Current Month}-\text{Posted Price Base Month}}{\text{Posted Price Base Month}} \right) \right]$$

where "posted price current month" shall be the current monthly invoice price (including taxes and freight) per barrel to Pioneer, as certified to the City on a copy of the first invoice or invoices of the month, of No. 6 fuel oil F.O.B. Pionite Road, Auburn, Maine, and where "posted price base month" shall be \$12.18/bbl. In the event that for any month Pioneer receives no invoice for No. 6 fuel oil, the "posted price current month" for that month shall be the Journal of Commerce posted price for No. 6 regular fuel oil (Portland Terminal) plus current tax and freight to Pionite Road, Auburn, Maine. In the

event that the posted price current month should for any month be less than the posted price base month, the monthly charge shall be calculated as follows:

- (5) Posted price current month (for month in which posted price is below posted price base month)
 $\div 6.3 \text{ million Btu/bbl} = \$/\text{million Btu (oil)}$
- (6) $\$/\text{million Btu (oil)} \div \text{boiler efficiency (I)} =$
 $\$/\text{million Btu (steam)}$
- (7) $\$/\text{million Btu (steam)} \times 1.235 \text{ million Btu/M lb}$
 $(\text{steam}) = \$/\text{M lb (steam)}$

where the boiler efficiency is determined as noted above for expression 2.

B. Under this alternative, the price to be paid by Pioneer for steam shall be \$6.36 per thousand pounds of steam, adjusted (either up or down) for changes in the Bureau of Labor Statistics Consumer Price Index for Urban Wage Earners and Clerical Workers, Northern Region Class D Areas, All Items (1967 = 100) (the "Index"). To calculate such steam price for any given month, the base price of \$6.36 shall be divided by the Index number for the month preceding the month in which the term of this Agreement commences pursuant to Subparagraph 3.1B, and the resulting quotient shall be multiplied by the Index number for the month preceding the month with respect to which the price calculation is being made. If the Bureau of Labor Statistics shall change the base period for the Index or its successor, the new Index number for the month preceding the month in which the term of this Agreement commences shall be substituted for the Index number originally used as the divisor pursuant to this Subparagraph 4.2B.

4.3 Credit for Condensate Return. The City shall give Pioneer credit for returned condensate based on the Btu value per thousand pounds of condensate as calculated using temperature and volume measurements pursuant to Paragraph 2.4. The value of condensate Btu's shall be based on the current

month steam charge for one thousand pounds of steam containing 1.235 million Btus, calculated as follows:

- (1) Current Steam Cost (\$/M lb) ÷ 1.235 million Btu/M lb = \$/million Btu
- (2) \$/million Btu × Y million Btu/M lb (condensate) = \$/M lb (condensate)
- (3) \$/M lb condensate × M lb condensate = total credit (\$)

The value of Y shall be the difference between the average returned condensate temperature and a base water temperature of 54°F, where each one °F per pound of water shall equal one Btu. As closely as practical, Pioneer shall return to the City's refuse-steam plant the percentage of Pioneer's total condensate equal to the percentage of total steam used by Pioneer which is produced by the City's refuse-steam plant.

4.4 Volume Discount. The City will give Pioneer a 2% discount on all steam purchased by Pioneer in excess of 171,600,000 pounds of steam per year (prorated pursuant to Paragraph 4.6).

4.5 Alternative Technology. If during the term of this Agreement it becomes economically feasible for Pioneer to retrofit its existing boilers or to install steam generating equipment utilizing a different technology commercially available in Maine which is capable of actually generating the entire steam requirements of Pioneer at a lower cost to Pioneer per 1,000 pounds of steam than the net price of steam then being charged to Pioneer by the City pursuant to this Agreement, then the City and Pioneer mutually agree to renegotiate the price of steam charged by the City to Pioneer pursuant to this Agreement. In the event that Pioneer and the City are unable to agree upon the price of steam to be charged by the City to Pioneer, such dispute shall be submitted to and settled by arbitration to be effected at Portland, Maine, or such other place as the parties may agree upon in writing, in accordance with the rules of the American Arbitration Association existing at

the date of submission, and both parties shall be bound by the decision of such arbitrators with respect to the price to be charged to Pioneer pursuant to this Paragraph 4.5 (which price shall never be higher than the price to be charged pursuant to Paragraph 4.2).

4.6 Billing Procedure. Except as provided in Paragraph 5.3 in connection with interruption of service, and in Section 7 in connection with termination of this Agreement, Pioneer agrees to pay the City annually (January 1 to December 31) for a minimum of 93,600,000 pounds of steam each year during the term of this Agreement, so long as the quantity and quality of steam specified in Paragraph 3.2 is made available to Pioneer by the City. The minimum annual charge shall be prorated in the event that initial deliveries and final deliveries occur on dates other than the first and last days of a calendar year, as the number of days of actual deliveries bears to the total number of days in such year. On or before the 15th day of each month, following delivery of steam, the City shall bill Pioneer for steam delivered to it during the preceding month less credit for returned condensate for such month. No credit shall be given for any quantity of condensate in excess of the quantity of steam delivered in any given month. Any balance due the City as a result of Pioneer's failing to utilize the guaranteed minimum quantities (i.e., 93,600,000 pounds per year before proration) will be billed annually. The volume discount pursuant to Paragraph 4.4 will also be credited annually. The billing rates used for any annual settlement will be based on the arithmetic average of the monthly rates for that year.

4.7 Payment of Bill. All payments will be due from Pioneer to the City within thirty (30) days of the billing date. The City may discontinue steam service for nonpayment of its bill upon not less than thirty (30) days written notice to Pioneer.

4.8 Favored Nations Clause. If at any time during the term of this Agreement when the City is selling steam to Pioneer the City simultaneously sells steam produced at the refuse-steam plant to any other person, firm, or corporation, then notwithstanding any other provision of this Agreement, the price of steam charged by the City to Pioneer shall be either the then current price for steam provided for in this Agreement or the net price for steam charged by the City to such other person, firm, or corporation, whichever price is lower.

Section 5. Operation of the Heat Recovery System

5.1 Minimum Weekly Operating Schedule. The City agrees to operate the steam generation system at least five 24-hour periods per week, from 11:00 p.m. Sunday, through 11:00 p.m. Friday, 51 weeks per year. In addition, the City further agrees to consider operating the system between 11:00 p.m. on Friday and 11:00 p.m. Sunday, and for the 52nd week of the year, if suitable combustible waste is available to the City and Pioneer has a need for the steam produced. However, no liability shall attach to the City for limiting its operation of the refuse-steam plant to five days per week, Sunday (11:00 p.m.) through Friday (11:00 p.m.), 51 weeks per year.

5.2 Water Supply and Treatment. The City agrees to supply at its expense all make-up water which may be required in addition to condensate return for boiler use. All boiler feed water will be properly deaerated and chemically treated so as to provide a non-corrosive, non-scaling steam. Pioneer will assure that the condensate return will be uncontaminated. Treatment chemicals may be added by Pioneer or the City to prevent corrosion in pipelines or improve heat transfer, but no such chemicals will be used which will be detrimental to the operation of the City's heat recovery equipment.

5.3 Notice Requirements for Steam Service Interruption. The City will make reasonable effort to give Pioneer notice by the quickest means possible of any unplanned interruption of the steam supply and to give reasonable advance notice of all planned interruptions of the steam supply. The City will make reasonable efforts to coordinate any planned interruption of steam supply with Pioneer so as to enable Pioneer to protect its equipment from damage which could result from planned interruption of the steam supply. In the event of any such interruption of service resulting in supply of steam by the City of the quality and quantity specified in Paragraph 3.2 or less than 255 days per year, the annual minimum payment required of Pioneer under Paragraph 4.6 will be reduced by a fraction, the numerator of which shall be the difference between 255 less the actual number of operating days on which steam of the quality and quantity specified in Paragraph 3.2 is supplied, and the denominator of which shall be 255. No liability in damages shall attach to the City or its agents, servants, delegates, or other representatives for failure to deliver steam.

5.4 Steam Plant Inspection. In the event that Pioneer desires to obtain business interruption insurance for its manufacturing facilities, the City agrees, upon reasonable notice from Pioneer, to permit inspection of its refuse-steam plant by representatives of the insurance company. The City will not be liable to undertake any expense which may arise as a consequence of said insurance company's inspection.

5.5 Steam Plant Operation and Maintenance. The City will operate or cause to be operated the refuse-steam plant in a manner consistent with good plant management practice. Without limiting the generality of the foregoing, the City will:

- A. Provide proper preventative maintenance, operating procedures and other precautions, and will as promptly as possible make all

required repairs and replacements, to prevent interruptions and provide high reliability of the steam supply.

B. Operate the refuse-steam plant in compliance with all applicable local, state and federal laws and regulations, and regularly remove and dispose of ash and any other waste products in accordance with all such laws and regulations.

C. Store solid waste materials in a properly designed silo, building or pit while awaiting incineration.

D. Maintain the buildings and land site consistently with good industrially zoned real property management practice, which shall include landscaping the site to make it attractive and compatible with Pioneer's property as a well-maintained industrial property.

5.6 Restriction on Use of Private Road. The City will not use Pionite Road as the route for solid waste disposal trucks to and from the incinerator facilities except in the event that the City is not able, for reasons beyond its control, to use its normal route for trucks to and from such facilities.

5.7 Laws, Permits, and Regulations. Pioneer will not be responsible for meeting present and future local, state or federal laws and regulations which cover air quality, odor, noise, waste-water disposal, solid waste disposal, and other conditions for the protection of the environment, or otherwise, and which are applicable to the City's refuse-steam plant. The City will at its expense obtain all required construction and operating permits before construction or operation, as the case may be, is commenced, and will operate the refuse-steam plant in accordance with all such laws and regulations as they may be amended from time to time.

5.8 Indemnity. Pioneer agrees to indemnify the City against and to hold the City harmless of and from any and all loss, liability, cost, or

expense arising out of the act or omission of Pioneer, its employees, and agents in connection with the performance of this Agreement. The City agrees to indemnify Pioneer against and to hold Pioneer harmless of and from any and all loss, liability, cost or expense arising out of the act or omission of the City, its employees and agents in connection with the performance of this Agreement.

Each party's obligation to indemnify the other pursuant to this Paragraph 5.8 shall survive termination of this Agreement with respect to causes of action arising prior to termination of this Agreement.

Section 6. Handling Pioneer Wastes. The City agrees at its expense to pick up and dispose of all Pioneer's combustible waste except sawdust type materials and liquids. Further, the City agrees that Pioneer will be charged no tipping fee for the service while this Agreement is in effect. Pioneer agrees that it will at its sole expense install up to the point of connection a pneumatic system for handling sawdust type materials and will provide at its expense reasonable access to Pioneer's plant for heavy motor vehicle equipment for City handling of other Pioneer combustible waste. Such pneumatic system will remain the property of Pioneer following termination of this Agreement. In the event that the City's refuse-steam plant has the ability to burn liquids the City agrees to negotiate with Pioneer for the disposal of such liquids upon mutually agreeable times.

Section 7. Termination

7.1 Termination With Cause. Pioneer may terminate this Agreement without any further liability under this Agreement:

A. by giving written notice to the City on or before January 15, 1982, in the event that the refuse-steam plant is not accepted by the City on or before December 31, 1981;

B. by giving written notice to the City on or before

January 15, 1982, in the event that by December 31, 1981, the refuse-steam plant has not generated steam meeting the quantity and quality requirements of Paragraph 3.2 for at least five (5) consecutive business days; and,

C. at any time after commencement of the term of this Agreement pursuant to Subparagraph 3.1B, by giving prompt written notice to the City in the event that during any period of ninety (90) consecutive calendar days the City does not supply steam meeting the minimum quantity and quality requirements of Paragraph 3.2 for at least seventy-five percent (75%) of the scheduled operating time under Paragraph 5.1.

In the event of termination pursuant to this Paragraph 7.1, Pioneer shall have a right of entry to the construction site for the refuse-steam plant for condition broken in accordance with the provisions of a Quit Claim Deed with Covenant, an unexecuted copy of which is attached to this Agreement as Exhibit "C". In the event of entry pursuant to such right of entry for condition broken, the City at its sole expense shall restore the construction site to its pre-construction condition, including removal of all buildings or other structures, but the City shall not be required to relocate Pioneer's utilities or pipelines. If the City fails to restore the site within six (6) months after termination and entry, Pioneer may undertake such restoration and shall be entitled to recover its costs of such restoration from the City, or at its option Pioneer may elect to retain the buildings or structures as its own property without any obligation to the City.

7.2 Termination Without Cause. Pioneer may unilaterally terminate this Agreement at any time upon not less than ninety (90) calendar days' prior written notice to the City. In the event of termination pursuant to this Paragraph 7.2, except as otherwise specifically provided in this Agreement all obligations of Pioneer and the City shall cease, and Pioneer and the City agree as follows:

A. For the balance of the term of this Agreement, but for not

more than twenty-four (24) calendar months commencing with the effective date of termination, Pioneer will pay the City the lesser of:

- (1) the operating costs (as defined below) of the refuse-steam plant as certified to Pioneer by an independent certified public accountant engaged by the City at its sole expense; or
- (2) the operating costs of the refuse-steam plant for the last full calendar year during which Pioneer purchased steam as certified to Pioneer by an independent certified public accountant engaged by the City at its sole expense and adjusted (either up or down) by the percentage change for the calendar year in question in the Bureau of Labor Statistics Consumer Price Index for Urban Wage Earners and Clerical Workers, Northern Region Class D Areas, All Items (1967 = 100) when compared to the last day of the last full calendar year in which Pioneer purchased steam.

As used in this Subparagraph 7.2A, "operating costs" shall mean the City's actual costs of operating the refuse-steam plant, including management fees paid to third parties, labor costs (including normal and customary fringe benefits) of employees directly employed at the refuse-steam plant, ordinary supplies and material, ordinary repairs and maintenance (excluding structural repairs, and repair or replacement of major components), insurance, snow and ice removal, electricity, fuel, gas and water charges, accounting and auditing fees, and miscellaneous charges (not to exceed \$5,000 per year) but excluding (i) landfill costs, (ii) administrative expenses allocated to the refuse-steam plant by the City, (iii) principal and interest on the bonds issued by the

City to finance construction of the refuse-steam plant and (iv) taxes imposed on the refuse-steam plant or the land on which it is located. Following receipt of notice of termination pursuant to this Paragraph 7.2, the City will not enter into any contract providing for the payment of management fees to third parties without the prior consent of Pioneer.

B. For the balance of the 20-year term of this Agreement, Pioneer will pay to the City amounts sufficient to enable the City to pay the unpaid principal and interest when due on the bonds issued by the City to finance construction of the refuse-steam plant, according to the amortization schedule provided by the Maine Municipal Bond Bank which is attached to this Agreement as Exhibit "D". The City represents and warrants to Pioneer that, Pioneer may at any time prepay to the City an amount equal to the unpaid principal of such bonds plus interest accrued to the date of payment without penalty or further obligation pursuant to this Subparagraph 7.2B. Pioneer will have no obligation to see to the application of the funds so paid by it to the City, and the City will indemnify Pioneer against and hold Pioneer harmless of and from all claims by the bondholders arising from payments of or failure to pay principal and interest when due on the bonds.

C. In the event that at any time following termination of this Agreement pursuant to this Paragraph 7.2 the City commences the delivery or distribution from the refuse-steam plant of steam aggregating 15,000 pounds or more per hour to one or more recipients, then Pioneer's obligations pursuant to Subparagraphs 7.2A and 7.2B shall unconditionally terminate effective the first day on which such steam is delivered to others.

D. Pioneer's obligation to pay operating expenses pursuant to Subparagraph 7.2A shall be reduced by the revenues received by the City in respect of the refuse-steam plant for the period in question, including but not limited to tipping fees and proceeds of the sale of steam to others. In the event that at any time following termination of this Agreement such

revenues from the refuse-steam plant exceed the operating costs of the refuse-steam plant as defined in Subparagraph 7.2A for the period in question, then Pioneer's obligation to provide funds sufficient to enable the City to pay principal and interest on the bonds pursuant to Subparagraph 7.2B shall be reduced by the amount of such excess revenues. In the event that at any time following termination of this Agreement the City's revenues from the refuse-steam plant in any calendar year exceed the total of (i) the operating costs of the refuse-steam plant for that year as defined in Subparagraph 7.2A, plus (ii) ash landfill costs, plus (iii) administrative expenses allocated to the refuse-steam plant by the City (which shall not exceed 6.98% of operating costs plus ash landfill costs) as certified to Pioneer by an independent certified public accountant engaged by the City at its sole expense, plus (iv) payments for that year of principal and interest on the bonds issued by the City to finance construction of the refuse-steam plant, then the City shall pay over fifty percent (50%) of such excess revenues to Pioneer until the amount so paid to Pioneer equals the total amount which Pioneer has previously paid to the City pursuant to Subparagraphs 7.2A and 7.2B.

Section 8. Amendments to Agreement. This Agreement and its Exhibits supersede all prior negotiations and oral understandings, if any, and may not be amended or supplemented except in writing signed by both parties.

Section 9. Notices. Notices required under Paragraph 5.3 will be given to and by the respective local operating personnel of the City and Pioneer. Notices other than those required under Paragraph 5.3 will be deemed properly given when in writing sent by certified mail, postage prepaid and addressed:

if to City
City Manager of Auburn
City Hall
45 Spring Street
Auburn, Maine 04210

If to Pioneer
Pioneer Division of LOF Plastics Inc.
Office of Division President
Pionite Road
Auburn, Maine 04210;

or to such other person or address as the respective parties may from time to time designate in a written notice to the other.

Section 10. Renewal. If either party wishes to negotiate a renewal of this Agreement upon expiration of the initial twenty (20) year term, it shall give notice of its desire so to negotiate to the other party on or before the date one year prior to the expiration of the initial twenty (20) year term. Upon receipt of such notice, the parties will negotiate in good faith to reach agreement on the terms and conditions of a renewal agreement, but all terms of this Agreement are subject to renegotiation in connection with any such renewal.

Section 11. Force Majeure

11.1 Liability. Except as otherwise provided in this Agreement, neither party nor its agents and employees shall be liable in damages to the other party for any act, omission or circumstance occasioned by or in consequence of any acts of God, strikes, lockouts, acts of the public enemy, wars, blockades, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, storms, floods, washouts, arrests and restraints of rulers and peoples, civil disturbances, explosions, breakage or accident to machinery or lines of pipe, the binding order of any court or governmental authority which has been resisted in good faith by all reasonable legal means, and any other similar cause, not reasonably within the control of the party claiming suspension and which by the exercise of due diligence such party is unable to prevent or overcome. Failure to prevent or settle any strike or strikes shall not be considered to be a matter within the control of the party claiming suspension.

11.2 Suspension of Obligations. All obligations pursuant to this Agreement (other than the obligation to pay sums then accrued, due and payable) of the party claiming suspension pursuant to Paragraph 11.1 shall be suspended until the cause for such suspension has been removed, and both Pioneer and the City agree to use due diligence to remove or overcome the cause for such suspension. Failure to prevent or settle any strike or strikes shall not be considered to be a failure to use due diligence.

Section 12. Interpretation. The paragraph captions are for convenience only and shall not affect the interpretation of this Agreement. This Agreement shall be construed and enforced in accordance with the laws of the State of Maine.

Section 13. Assignment. This Agreement may not be assigned by either party without the prior written consent of the other party; provided, however, that LOF Plastics Inc. may, without the consent of the City, consolidate with or merge into another corporation or permit one or more other corporations to consolidate with or merge into it, or transfer all or substantially all its assets to another corporation and thereafter dissolve, or sell or transfer the Auburn, Maine facilities of its Pioneer Division to another corporation, and may, in connection with any such consolidation, merger, sale or transfer assign this Agreement to the surviving, resulting or transferee corporation without the consent of the City, but only on the following conditions:

A. that such surviving, successor or transferee corporation is a corporation organized and existing under the laws of the State of Maine or is duly qualified to do business in that State;

B. that in connection with any such merger or consolidation in which LOF Plastics Inc. is not the corporation resulting from or surviving such merger, the corporation resulting from or surviving such merger shall (i)

expressly assume and agree to perform all of Pioneer's obligations under this Agreement and (ii) shall file with the City a letter by a firm of nationally known certified public accountants stating that after consummation of such consolidation or merger the corporation resulting from or surviving such merger will have an excess of consolidated assets over consolidated liabilities of at least \$20,000,000; and

C. that in connection with any such sale or transfer, the corporation to which such transfer is made shall (i) expressly assume and agree to perform all Pioneer's obligations under this Agreement and (ii) shall file with the City a letter by a firm of nationally known certified public accountants stating that after consummation of such transfer the corporation to which such transfer is made has an excess of consolidated assets over consolidated liabilities of at least \$20,000,000.

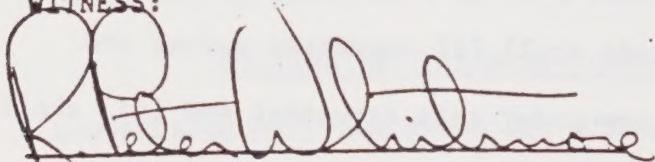
Section 14. Authority

14.1 City's Authority. The City represents and warrants to Pioneer that this Agreement and the transactions contemplated by this Agreement have been duly authorized by the City Council of the City of Auburn and that no further action or authorization is necessary to make this Agreement a binding commitment of the City.

14.2 Pioneer's Authority. Pioneer represents and warrants to the City that this Agreement and the transactions contemplated by this Agreement have been duly authorized by the Boards of Directors of LOF Plastics Inc. and Libbey-Owens-Ford Company, and that no further action or authorization is necessary to make this Agreement a binding commitment of Pioneer.

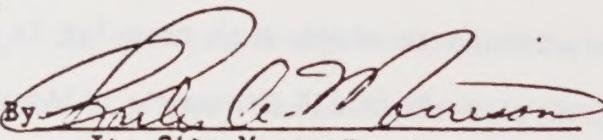
IN WITNESS WHEREOF, the City of Auburn has caused its corporate seal to be affixed to this instrument, and has caused this instrument to be signed for it and in its name by appropriate municipal authorities and by its duly authorized officials as set forth below, and LOF Plastics Inc. has caused this instrument to be signed by its duly authorized officers on the date first mentioned above.

WITNESS:



CITY OF AUBURN

By

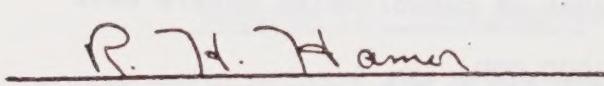


Its City Manager

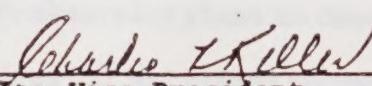
Charles A. Morrison

LOF PLASTICS INC.

Attest:


R.H. Whitmore

By


Charles L. Keller

Its Vice President

Charles L. Keller

U.C. BERKELEY LIBRARIES



C124880480

